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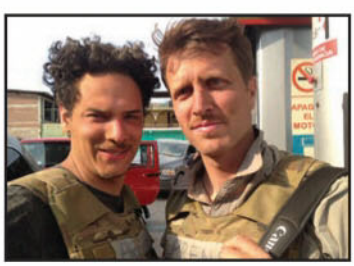

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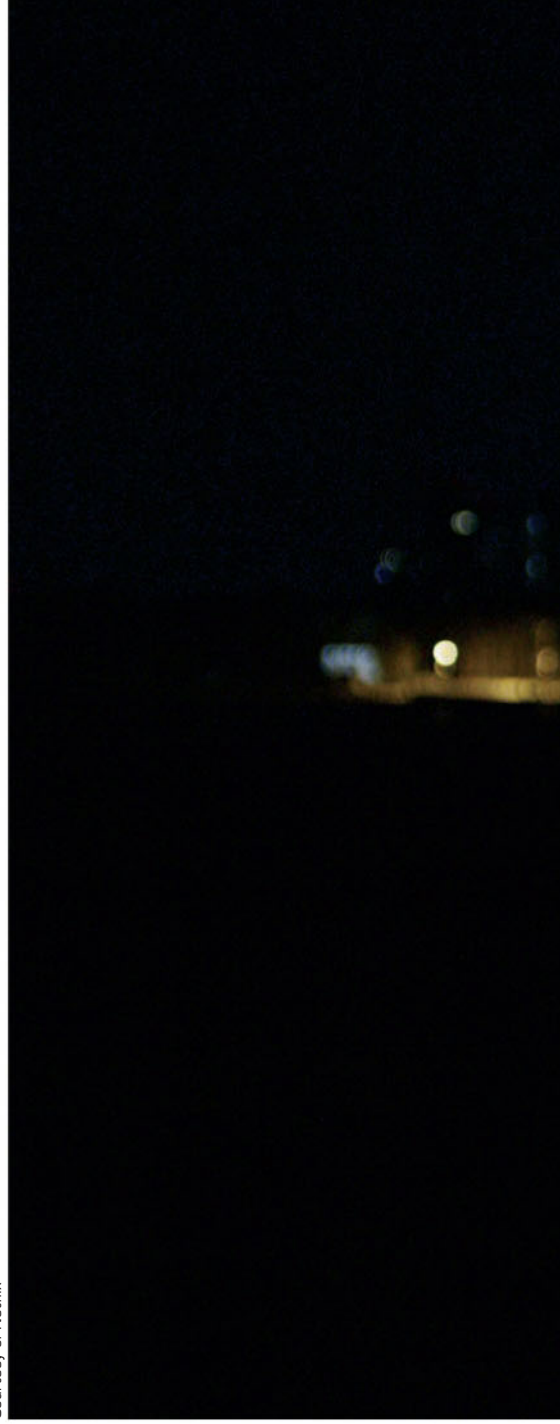

Courtesy of Netflix

INSIDE STORY

HDVideoPro was established in 2007, and in less than eight years, the content we've been covering has outgrown our name. With the exception of broadcast, like film before it, HD cameras are on their last legs, especially with ARRI transitioning their new cameras (ALEXA Mini, ALEXA SXT) to 4K. Many of the latest compact mirrorless cameras have implemented onboard 4K, as well, such as the Panasonic GH4, Samsung NX1 and the new Sony a7R II, which can capture 4K video in the Super 35mm format with no pixel binning. You even can capture decent HD video on a smartphone—although probably not for a feature, right? Not anymore.

For this issue, we profile Sean Baker's excellent micro-budget feature film, *Tangerine*, which was shot with an iPhone 5s on the streets of Hollywood. I saw the movie at this year's Sundance Film Festival, knowing nothing about it beforehand. From the opening scene, I was startled by the film's unique look, which featured extreme saturation and contrast, blown-out highlights and dynamic movement. Was it shot on a GoPro? A MiniDV camera from the '90s? It didn't matter because, after only a few minutes, I became completely transfixed with the story and the performances of Baker's two leads—both first-time performers on camera. When learning after the screening that Baker had shot the film with an iPhone, I was blown away—not only by the technology, but also Baker's ingenuity. (He shot with the iPhone primarily due to

budgetary constraints.) Unlike most filmmakers who try to turn their DSLR into a digital motion-picture camera, Baker used just an anamorphic lens adapter, a $150 camera stabilizer and a $7.99 iPhone app.

Baker proved that a good filmmaker can take his or her camera's shortcomings and turn them into strengths. Since his leads were first-time actors, the iPhone made them feel more at ease since most of their dialogue scenes were improvised. (After all, they were taking selfies between takes with their own phones.) According to Baker, if they had shot *Tangerine* a year and a half from now, he would have had his iPhone up on a drone.

Speaking of drones, frequent *HDVP* contributor Dan Brockett writes about the state of the camera drone for film and TV productions. As you probably know, drones have changed the face of both high-end and indie productions. (You can now buy a quadcopter for less than $100 at your local Toys "R" Us.)

The only problem is where can you fly them? Living in a crowded city like Los Angeles, I'm terrified of flying a personal drone for fear of crashing it into someone's car or property, or much worse—a person.

Brockett's story focuses on drone regulation, the advantages and limitations of flying one, and more. He also interviews some of the leading drone operators and discusses how they're collaborating with producers on numerous productions.

If you're thinking about buying a personal drone in the near future, this is a must-read.

—Neil Matsumoto, Editor

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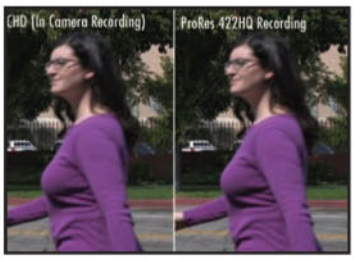
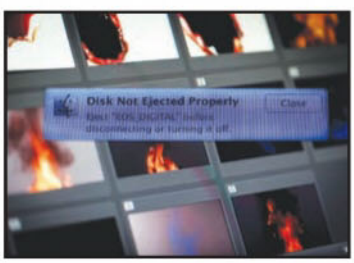
Columns





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Tangerine

Shot entirely on an Apple iPhone 5s, *Tangerine* was a hit at the 2015 Sundance Film Festival. Independent filmmaker Sean Baker went with the iPhone for budgetary reasons. Rather than spend limited resources on bigger, more complex gear and the extra crew required to operate it, Baker and co-cinematographer Radium Cheung kept the tools simple and invested in locations and extras. Also, using such an innocuous device—everyone has an iPhone—made it possible to shoot in locations that would have been locked off had they used other gear. *Tangerine* is Baker's fifth feature film, and you can learn more about how it came together in the article "Down On The Street" in this issue of *HDVideoPro*.

Photos courtesy of Magnolia Pictures

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4K GAME CHANGER

The new **Sony HDC-4300** is the first camera to use three ⅔-inch 4K image sensors while mounting B4-mount lenses like Sony's popular HDC-2000-series cameras. The existing HDLA-1500 series, control and shading systems, viewfinders and master setup units can be swapped between the HD and 4K systems. The HDC-4300 can handle 4K/HD operation, with 2x and 3x super-slo-mo as standard, as well as speeds up to 8x, to capture high-quality replays and specialty program effects. Ultra-high-precision alignment technology is used to implement three 4K sensors on a new prism, allowing the support of next-generation ITU-R BT.2020 broadcast standard's widening color space. List Price: TBD. **Contact:** Sony Electronics Inc., store.sony.com.

ALL-IN-ONE PACKAGE

The **Canon XC10 4K digital camcorder** contains a 1-inch, 12-megapixel CMOS sensor delivering up to 12 stops of dynamic range and a 10x wide-angle zoom lens (35mm-equivalent zoom ratio of 24.1-241mm for stills and 27.3-273mm for video) that remains compact because of two UD lens elements, two Hi-UD lens elements and two three-sided aspherical lens elements. The XC10 contains the DIGIC DV 5 signal processor in order to perform 4K capture, and provides 5-axis image stabilization (full HD only), as well as slow and fast motion recording. When recording 4K, the XF-AVC Intra codec is employed, and for full HD, an XF-AVC Long GOP is used. Other features include a dedicated mic and headphone jack, a built-in mic for audio recording, a Vari-Angle touch-screen LCD monitor and a rotating handgrip. List Price: $2,499 (includes a San Disk 64 GB CFast 2.0 card and card reader). **Contact:** Canon U.S.A. Inc., www.usa.canon.com.

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EASY 3D TITLES

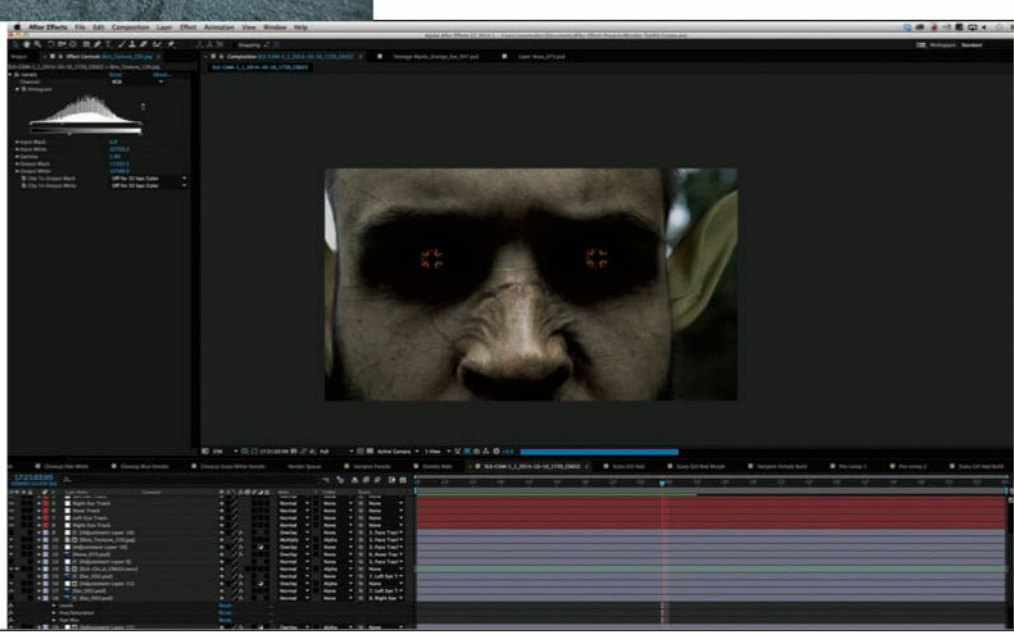
The major update to **Apple**'s **Final Cut Pro X** and **Motion** are 3D titles. Perhaps more than any other feature, Final Cut Pro X has excelled at letting users—with no motion-graphics experience—create pro-level titles. Now you can perform titles using animated and customizable 3D text. There are cinematic templates with built-in backgrounds and animations, including the ability to create hundreds of combinations with different materials, lighting and edges, and 2D titles can be converted to 3D as well as opened in Motion to add additional effects. For effects work, masks are a big deal in FCP X 10.2. You can apply a super-ellipse Shape mask and Draw mask to any clip with options for linear, Bezier or B-spline smoothing, and have the ability to save custom effects as presets. And the Color Board is now merged into the new Color Correction effect. **Contact:** Apple, www.apple.com/final-cut-pro.

FREEK OUT

Getting professional-looking shots from a moving car can bring a lot of production value to your low-budget indie film. **DitoGear**, a provider of cutting-edge motion-control equipment, just announced their new **VibraFreek**, which functions as a supplementary rig for safely mounting and operating gimbal stabilizers like the DJI Ronin or Freefly Systems MōVI on your moving car. The main feature of the VibraFreek is its vibration-dampening arm, which reduces low- and high-frequency vibrations, giving you smooth and safe operation of your mounted gimbal/camera system, even at fast speeds. There's also an X/Y platform (sold separately) that improves the operation of the system when shooting in rough environments like extreme speeds, wind or rough terrain. The VibraFreek arm can be mounted and adjusted on virtually any moving vehicle. List Price: $2,450 (VibraFreek arm); $2,850 (VibraFreek complete system with Spider Mount); $4,850 (VibraFreek complete system with Pillar Mount). **Contact:** DitoGear, ditogear.com.

REAL DRAG-N-DROP FX

During the month of June, **Rampant Design** presented a "30 Days of Design" initiative. Each week, Rampant Design founder and VFX artist Sean Mullen of *Charmed*, *NCIS*, *Felicity* and *Nip/Tuck* fame released 2K, 4K and 5K custom-designed **Style Effects** totaling nearly 1,000 effects by the month's close. Packaged as QuickTime files, the ultra-high-definition Style Effects aren't platform-dependent, and can be easily dragged and dropped into any timeline. The nine collections include Matte Transitions, Rampant Flare Transitions, Rampant Glitch Transitions, Rampant Paint Strokes and Rampant Paint Stroke Transitions. List Price: $49-$509. **Contact:** Rampant Design, rampantdesigntools.com.



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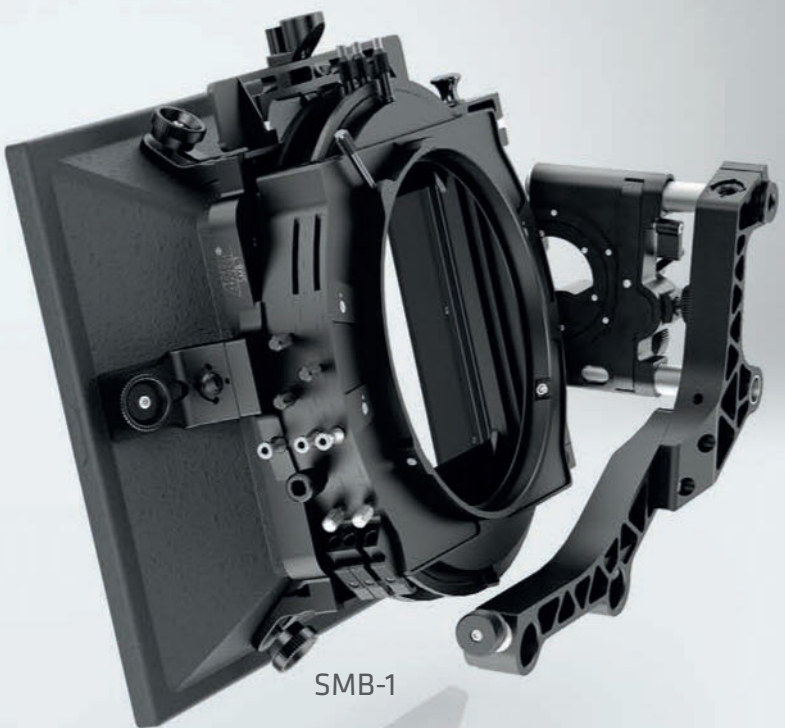

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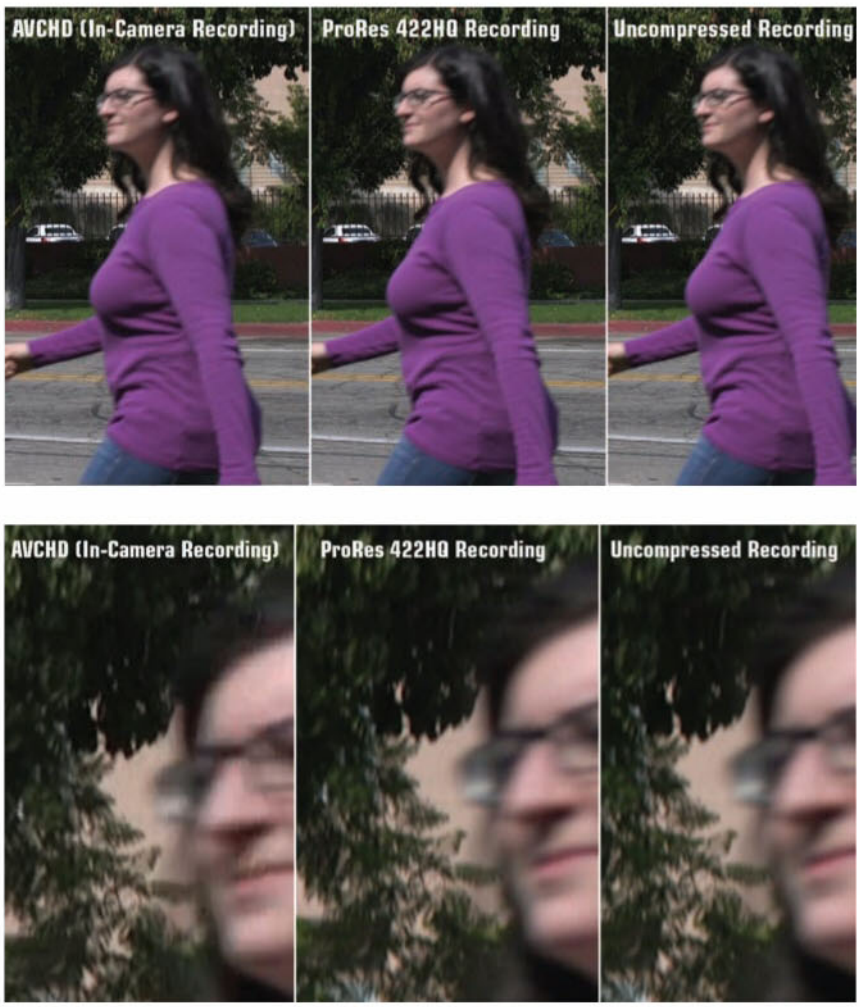
COMPACT POWERHOUSES

Sony continues to include high-quality video functioning in small packages with the **RX10 II** and **a7R II**. The RX10 II pairs a 1.0-type stacked EXMOR RS CMOS sensor with a Zeiss Vario-Sonnar T* 24-200mm *f*/2.8 lens. The DRAM memory chip enables sharp, clear images with a wide-open aperture at brightness levels up to EV19 while minimizing any rolling shutter effect and allows image data to be read 5x faster than its predecessor. The camera provides 40x super-slow-motion video capture at 240 fps, 480 fps and 960 fps at 60/30/24p. The ultrafast anti-distortion shutter has a maximum speed of 1/32,000 seconds. The a7R II interchangeable-lens camera uses a back-illuminated full-frame EXMOR R CMOS sensor with 42.4-effective megapixels, an expanded ISO sensitivity of 102,400 and 399 focal plane phase-detection AF points. The 5-axis stabilization balances for angular shake, shift shake and rotational shake, which equates to a 4.5-step faster shutter speed compensation. The a7R II records 4K video in either Super 35mm crop mode or full-frame with full-frame mode using the full width of the 35mm sensor. Both cameras use an XAVC S codec and include Picture Profile, S-Log2, S-Gamut and additional pro video features. List Price: $1,300 (RX10 II); $3,200 (a7R II). **Contact:** Sony Electronics Inc., store.sony.com.

Better Video Through Compression

Comparing AVCHD, ProRes and uncompressed video

By Andy Shipsides



AbelCine recently hosted the VII Evolution Tour, an event series for photojournalists making the transition to video production. The tour helps attendees identify and overcome the challenges of going from stills to motion production. A topic that was covered during this event was the use of external recorders. In one of her workshops, photojournalist and filmmaker Jessica Dimmock talked about her transition and showed off her camera rig. She uses a Canon EOS C100 along with an Atomos Ninja Blade external recorder. Many attendees asked why she used that particular combination, and Jessica explained that the resulting ProRes compressed video is better quality than the internal camera recording and in a format that editors like. After the workshop, a few attendees asked me to explain in more detail the benefits of using an external recorder. Keep reading to learn more about the advantages of external ProRes recorders, and more about video compression, in general, along with plenty of visual examples.

WHAT'S THE DIFFERENCE?

Most video cameras and DSLRs have an internal recording format designed to get you the most footage possible on a media card. For example, the Canon EOS C100 uses an AVCHD format running at a maximum of 28 Mbps, which is very lightweight, resulting in about 12 GB per hour of footage. Compare that to the popular Apple ProRes 422 HQ compression, which comes in at 220 Mbps or over 100 GB per hour. That's a big difference in file size, so you can see why many cameras go for the more compressed format. But that big difference in file size does give you a noticeable improvement in video quality—you just need to know where to look to find it.

I wanted to visualize the difference between the internal compression on these cameras and an external ProRes recording. I combined the Canon EOS C100 Mark II with two external recorders to give me ProRes 422 HQ, as well as an uncompressed recording. I used an Atomos Ninja Blade for the ProRes and the Blackmagic Design HyperDeck for a completely uncompressed recording. The uncompressed recording served as a baseline of what the camera could output without any compression added. With this setup on my cart, I grabbed a few video clips, recording to the camera and both recorders simultaneously.

Above is the result of the three recordings side by side, and it's hard to tell the difference until you zoom in.

At 400%, you can see there's a lot of detail lost in the internal recording. The leaves in the trees are noticeably blurrier. But the ProRes and uncompressed recordings look about the same, so let's look a bit deeper.

To see the exact differences between the three recordings, I brought them into Adobe's After Effects and built a difference map. The colors in the image represent the differences between the two videos—the more colors you see, the more degradation there is. The internal comparison has some obvious difference, especially on edges, but the ProRes recording is completely black, meaning it has a very minimal difference compared to the uncompressed recording. By gaining it up 10x, you can really see the difference between the internal and ProRes recordings.

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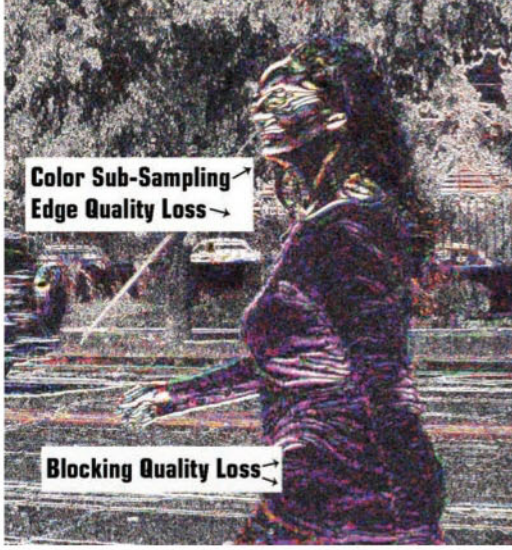
A LITTLE BIT ON COMPRESSION

A lot of work goes into making video small. The first is blocking. Video compression blocks together similar frequencies, colors and textures that are next to each other. Say you're shooting a blue sky that's all basically the same color blue. The compression will lump together that blue sky into large blocks. This saves a lot of space, as not every pixel has to be saved. In the image to the right, we can see this compression happening—it's the colored noise that you see between edges. That information has been lost, so it shows up in the difference map. Generally, as data rates go up, the blocks get smaller in size—that's why ProRes has notably less quality loss.



Another compression technique that we can clearly see in our example is color subsampling, or the 4:2:2, 4:2:0 thing. The C100 outputs 4:2:2 video for external recording, but records in 4:2:0 internally. Many people think that color subsampling makes an image less colorful, which isn't the case. What it's really doing is reducing the color resolution of an image. A 4:2:0 and 4:2:2 image will share the same basic black-and-white data, but the 4:2:0 image has half the color information stored in it. We can see this in the difference map as glowing edges. They show up in the difference map because the edges are transitions from one color to another, and we threw away half the color, so these edges just aren't as good as they used to be. This is why 4:2:0 isn't great for greenscreen work where we want clean edges.

Hopefully, this gives you a better understanding of what you lose on the compressed recording and what you gain with an external ProRes recorder.

WHY NOT GO UNCOMPRESSED?

A question that many of you are probably wondering now is, why not just go uncompressed all the time? Well, the answer is pretty straightforward—file size. The internal recorded clip came in at 170 MB/s, the ProRes clip was 1.5 GB/s, and the same uncompressed clip was over 10 GB/s. That's a huge difference in file size, so uncompressed isn't really an option for most of us.

BUT IT'S JUST FOR THE WEB

I've often heard the comment that recording high quality doesn't matter

Name	Size	Kind
InternalRecording.MTS	171.2 MB	Turbo....ument
ProRes422HQ.MOV	1.53 GB	QT movie
Uncompressed.mov	10.08 GB	QT movie

because the project is "just for the web." It's true that web compression is pretty extreme, but starting with higher-quality material always yields a better result on the web. To show this, I've compressed both the original internal recording and the ProRes recording into a web compression used for YouTube and Vimeo. Then, I generated the same difference map as before.

Photos courtesy of AbelCine

As you can see in the images above, the ProRes web compression is considerably closer to the original uncompressed video. So it's pretty clear that starting with a higher-quality video gives you better results on the web.

EXTERNAL RECORDER OPTIONS

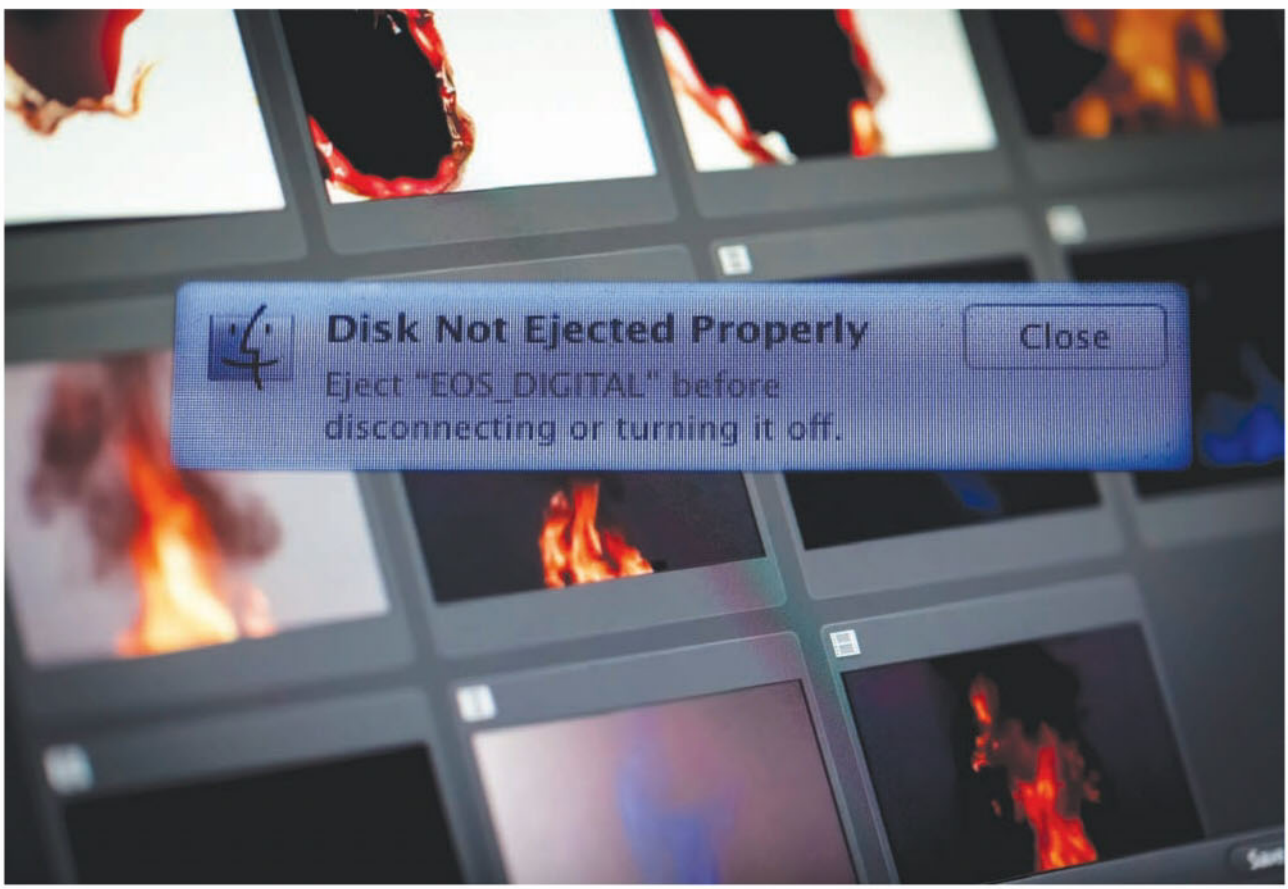
There are many great external recorders out there today that can record in ProRes and other high-quality formats. A couple of great options include the Atomos line of recorders, from the HDMI-only Ninja line to the 4K recording Shogun. Convergent Design has their Odyssey line of products, with the Odyssey7Q/7Q+ giving you all the way up to 4K ProRes recording. And Sound Devices has their PIX and new PIX-E 4K ProRes recorders. All of these are great options, each with their own advantages. These recorders can work with a wide variety of cameras, from old to new, and can all be used to extend the life of your camera. Give us a call at AbelCine to discuss the best solution for you. HDVP

Andy Shipsides is a N.Y.-based Camera Technology Specialist and AbelCine's Director of Education. Learn more at training.abelcine.com.

Proper Data Wrangling

Plus, whether to shoot 4K or 2K, and explosion-proof cameras

By Michael Guncheon



Courtesy of Michael Guncheon

A CAUTIONARY TALE

This really isn't a question, but a way for me to shout from the rooftops about making sure you pay attention to how your data is handled. I recently had a project with a short time frame and a tight budget. I didn't have real control of who was going to be on the shoot and what their responsibilities would be. That was handled by the person managing the budget. One of the decisions was to hire a production assistant who would also double as the person responsible for off-loading all the footage to drives during the day. To make a long story short, we ended up with about 95% of the footage that we shot. Not bad, huh? Of course, 99% would have been good, and 100% would have been ideal.

Not only that, but it took the editor a day to get things reconfigured so he could ingest everything properly. I'm not sure what he ran into, but there were grumblings of renaming and not following the folder structure. In the end, we got something done. It was painful, and there was at least one shot that I really could have used. Learn, and live to shoot another day.

M.L.
Via email

Thanks for the note, or should I say horror story. It's a good reminder to us all to pay attention to all the parts in the machine. As you noted, all it takes is one flaw to affect the whole process. I understand budgets can be spread thin. I've noticed that some people think having a DIT or even just a data manager is a luxury. Instead, a production assistant is hired and then trained to do the job of wrangling the data.

I'm not saying a production assistant can't be trained to do the job. The problem is that people assume the PA is on the shoot so they can do all sorts of things, with data management just a part-time job. That's where problems can happen. Instead of focusing on the job at hand—making sure the data is off-loaded and verified—they have to multitask. For example, they might start the file copy process and then run off to do something else the director or producer has asked for. As a result, they might not have been at their computer when someone tried to look at a shot and stopped a process or moved a file. Or they might not have noticed when someone accidentally moved a memory card from the waiting-to-be-off-

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As you said, 100% would be ideal. The way to assure that is to make sure the person handling the data is 100% focused on that job.

SHOOT 4K OR 2K?

Q *For some projects down the road, I've been given access to a 4K camera for capture. I feel like this is some sort of "Twilight Zone"—"be careful of what you wish for." Now, I seem to have more dizzying options than ever before. My struggle is mostly centered about the format I should shoot in. With one big project, I'll be shooting a ton of footage. Actually, I won't be doing the shooting, but want to make sure my camera dude is getting what I need.*

I don't think I really have the storage, both short and long term, to shoot it at 4K. Since my final delivery is HD (and it doesn't have much shelf life), I thought it might make sense to meet halfway and shoot 2K. That would allow me to push in on a few shots and give me some flexibility with framing during the edit.

Before you start questioning why I would even choose the 4K camera since I'm not going to use all of its resolution, I do have an answer for that. We'll be traveling for a while on several different projects and my cameraman doesn't want to keep switching cameras midstream. He thinks it makes sense to keep with one camera so he can be "used to it" instead of switching back and forth and trying to remember menus and switch placement.

F.D.
Via email

A I'm glad you're asking this question now. Thinking about storage and postproduction, and how it's impacted by choices you make in preproduction, is smart. I remember hearing a post supervisor commenting, "When you rent a camera, they don't charge you more when you toggle the resolution from HD to 4K. But that little change can have a dramatic effect on your post budget."

I also think your camera guy is wise because, if he only has to deal with one camera, he doesn't have to keep switching gears. Although switching cameras in the middle isn't a deal breaker, getting used to a camera day in and day out can lead to great efficiencies when shooting.

But there's one error in your thinking about which resolution to shoot in. Although 4K is said to be four times the resolution of HD, don't assume that 2K is two times the resolution of HD. Perhaps you don't think that, but since you mentioned that you wanted the flexibility to "push in," I assume that you think 2K is a big step up over HD in terms of resolution. Unless you want to start scaling up your footage beyond 100% (you'll also start to lose image quality), you won't be able to push in. HD and 2K share the same vertical picture count, which is 1080; (full) HD is 1920x1080, and 2K is 2048x1080. Note that the vertical pixel count is the same.

With the larger horizontal pixel count, you do have the flexibility to pan left or right. But that extra space to the left and right doesn't give you the flexibility to dramatically change composition (probably to the delight of your camera guy).

That flexibility also comes at a cost. As you can see from the pixel count, 2K isn't at the 16:9 aspect ratio that 1920x1080 is; it's more like 17:9. So, if you don't want small black bars on the top and bottom of the screen, you'll have to crop the captured image on the left or right side—or on both sides.

If you monitor with a 16:9 view during capture, this won't be a problem. But if you don't, you may be frustrated with how the final composition turns out.

EXPLOSIVE!

I'm to shoot a corporate video for a company shipping chemicals at sea. I can shoot the way I usually do on the bridge, but I can't shoot anything outside because, at times, the ships carry highly explosive chemicals. I'm to use an "intrinsically safe" camera, which stands for explosion-proof equipment. Problem is, it's hard or almost impossible to find one to rent—and I live in Burbank, California. Is there a way to make one of my cameras explosion-proof? I own a Blackmagic Production Camera 4K, Blackmagic Pocket Cinema Camera and the normal barrage of GoPros. I'm ruling out my Panasonic HPX500. What are my best options on the "making of" or the rental side?

D.A.
Burbank, California

A I think the "making of" option is off the table, for several reasons. First, you've probably read various online discussions about using underwater cases (or other styles of cases) as a means to segregate electronics from an unsafe atmosphere. This comes from the assumption that preventing explosions is all about eliminating sparks when buttons are pushed or cameras are turned on. So let's go with that assumption. An underwater housing might seem like the solution. But what about static electricity? We know that causes sparks. Cases that are made of plastic might be just the right formula to build up static electricity when they react to clothing that you're wearing. The cases are designed to keep water out, not to keep static electricity from forming.

Second, even if you get past the "spark" issue, "intrinsically safe" means much more. For example, the rig has to be designed so that, if there's a hardware fault—such as a component failure or if the battery shorts out—*nothing* will happen that could cause a reaction in the potentially explosive atmosphere. Once again, underwater housings are designed to keep water out.

Third, let's say you could meet the various technical specifications for creating an intrinsically safe camera. You won't have the certification documents that a safety officer could sign off on—and they always err on the side of caution for obvious reasons.

As you can tell, I think specially designed equipment is really the way to go, but this is an extremely narrow niche product with incredible liability issues. CorDEX (www.cord-ex.com) makes a unit that you could consider. You might be able to locate some places that rent them. HDVP

To have your video production technical questions answered, send an email to videoassist@hdvideopro.com.

Sound & Vision

Zoom Q8 Handy Video Recorder, and Tascam DR-70D Audio Recorder

By Dan Brockett

Zoom's Q8 Handy Video Recorder is a small HD camcorder that features more advanced audio recording capabilities.

A rep from Zoom recently approached me to check out their new Q8 Handy Video Recorder. A few weeks after NAB, a box from Zoom showed up. The question is, what's a "Handy Video Recorder," and why would a sound-oriented person be interested in it? Zoom, as you probably know, makes a line of digital audio recorders that have gained considerable popularity in low-budget productions. The Q8 Handy Video Recorder is a small HD camcorder that also features a more-sophisticated-than-average audio recording capability.

In examining the Q8, I was trying to figure out who this product was aimed at. It's a camcorder, but it features built-in, stereo combination ¼" XLR audio inputs, which have 48V phantom power capability to power professional condenser mics. These inputs, combined with the included XYQ-8 stereo X/Y microphone capsule, allow the user to record four separate audio channels to an SD card. Besides the audio capability, the Q8 is a full-function HD and 2.3K video camcorder. The Q8's built-in microphone swivels from an up position when shooting video to a down position when using the Q8 as an audio recorder or transporting the unit.

The video portion of the Q8 reminds me of a larger, more fully featured GoPro-type of video camera. In doing some research and reading reviews, the Q8 is aimed at and has become popular with podcasters and web shows. The Q8 appeals to nontechnical-savvy users who need decent-quality video for web video demonstrations, podcasts and video podcasts. The unit features a fixed wide-angle lens that can be "zoomed in" using a touch-screen control on the Q8's foldout video screen. The Q8 also features a mixer screen that allows the user to set microphone levels, pan knobs, lo cuts and dynamics. The unit records up to 24-bit/96 kHz WAV and AAC audio formats and QuickTime-formatted .MOV video. The Q8 is capable of recording video in formats as small as 800x480 at 5 Mbps, all the way up to a larger-than-1080 format called 3M (2.3K), which is 2304x1296 at 24 Mbps, allowing you to reframe shots when editing video on a 1080 timeline. Note that the Q8 only records at 30 and 60 fps frame rates, not at 24p.

I have to give props to Zoom for trying something new and out of the box to address the needs of a new market—non-video-skilled users who need to record good-quality audio and video without much technical skill. Based upon my time with the Q8, the audio quality is on par with the audio recorded by other small digital recorders like the Tascam DR-40 and Zoom's own H4n. The video quality, while nothing unusual or special, is fully usable for quality web video. If you think about it, most small video cameras only feature a 3.5mm audio input and questionable audio quality. The Q8 has ¼" XLR audio inputs and decent audio quality, and is capable of shooting video of a good enough quality for web/nonbroadcast usage. I can see this unit being very useful for journalists, podcasters or documentary filmmakers who are filming undercover or for travel situations in remote locations where every ounce counts.

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The Q8 would be an excellent backup camera also when size and weight are a concern.

The Zoom Q8 Handy Video Recorder sells for $399.99. It's a consumer-grade product and isn't made for dropping, crunching against concrete and withstanding soaking rain, but if you take care of it, the Q8 should be a handy addition to your sound or podcasting gear locker.

TASCAM DR-70D AUDIO RECORDER

Q *I'm looking for an effective audio solution for my new Samsung NX1 camera. I mostly shoot interviews and would like to record the output from a Tram TR50 lavalier (wired). What would you recommend for a low-cost audio recorder that won't cost a fortune, but will record fairly high-quality audio?*

Perry H.
Via email

A The Samsung NX1 is a newer, 4K-capable DSLR-style camera. While I haven't specifically tested the audio on the NX1, I have recorded a considerable amount of material using the Canon EOS 5D Mark III. Generally, DSLR built-in audio is of poor quality, and I'd never recommend using it for anything other than scratch audio. You can utilize just about any digital audio recorder with your camera, but there are some models on the market that have features that make shooting with a DSLR, and editing the footage, quicker and easier.

The Tascam DR-70D can be mounted directly between a tripod and the camera or on top of the camera, resulting in a compact package. The DR-70D has two built-in mics. In addition, it provides four XLR/TRS combo jacks that can be used to record four channels of audio with excellent sound quality using professional microphones. Thanks to a camera output, the recorder's stereo signal can be recorded also on the camera to ease subsequent editing of the material in combination with the slate tone function of the recorder. On the other hand, you can use the camera input to monitor the audio of the camera using the recorder.

(Cont'd on page 69)

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The DIGITAL FILM Camera

The 4K AJA CION offers a true cinematic experience in a simple package

BY NEIL MATSUMOTO

Founded in 1993 by engineer John Abt, AJA Video Systems, up until now, was known as the company with all of the converters, rackmount frames, I/O cards and, more recently, external recorders (Ki Pro series). Now they're following in the footsteps of Blackmagic Design, who have had recent success in releasing a number of digital motion-picture cameras aimed at the indie filmmaker market. At NAB 2014, AJA announced their first camera, the CION, and although it has taken awhile to come to market, the CION generated a ton of buzz in the indie filmmaker community. As I've stressed many times before, there never has been a better time to own your camera, and with the release of the CION, there's a significant new player in the indie film camera marketplace.

What's even better is that AJA recently launched a "Summer of Savings" promotion, reducing the already low price of the CION to just $4,995 (down from $8,995). This new price puts the CION in line with a fully loaded cinema-ready DSLR, yet significantly lower than your standard digital cinema motion-picture camera that can cost in the tens of thousands. Like Blackmagic's cameras, the CION gives you tremendous bang for your buck.

So what is this new camera, and why should you be interested? The CION is a production camera that lets you capture "ready-to-edit" 12-bit, 4:4:4 internally. AJA sent over a review unit with a Zeiss CP.2 50mm prime lens, and after shooting with it just for a few days, I was greatly impressed by its simplicity, design and, most importantly, image quality. Perhaps more than any camera I've tested, it offers the most film-style features, reminding me of the Super 16 cameras I used to shoot with back in the day.

CION KEY SPECS

- Can record 4K, UHD, 2K, 1080p or 1080i
- 4K APS-C-sized (22.5x11.9mm) CMOS sensor; electronic global shutter
- Can capture Apple ProRes files onboard or output AJA Raw to external recorders or Thunderbolt RAID/laptops
- Comes standard with a PL mount that you can remove for use with third-party-mount adapters
- Exposure index is 320, 500, 800 and 1000
- Captures onboard files to proprietary AJA Pak media
- Four 3G-SDI main outputs, two 3G-SDI monitor outputs and two HDMI outputs

TOP: Two third-party accessories you'll need for the CION include an EVF and a battery support system. ABOVE: There are six menu buttons that give you access to camera settings, and you scroll through menus with a large, round knob.

FORM FACTOR & OPERABILITY

At first glance, the CION has an incredibly simple and straightforward design that some might mistake for a lack of features. The camera's sleek ergonomics is one of its biggest strengths, with a rectangular form factor more in line with the ARRI AMIRA rather than the box-like shape of the RED EPIC DRAGON or Blackmagic Production Camera 4K. Having recently tested the Blackmagic URSA, the most welcome aspect of the CION is its weight (6.4 pounds) compared to the URSA (16.32 pounds).

Because of its longer chassis, the CION can be shoulder-mounted, making it much easier to perform handheld shooting than compact cameras, where you have to hold it out in front of you—a difficult task for long takes. I also really liked the CION's padded and contoured shoulder support at the bottom of the camera, which made the camera more comfortable to shoot with. With the top Handle Grip accessory—included as standard, as well as the Handle Mount—I found it easy just to grab the camera, sling it over my shoulder, press record and shoot. I also used an

The CION is a production camera that lets you capture edit-ready 12-bit, 4K ProRes files and comes standard with a PL mount.

extension arm and contoured handle to balance the camera with my right hand. (The extension arm and handle aren't included.)

THIRD-PARTY NEEDS

Although the CION has a low price, you'll have to drop some more dough to get it up and running. Although I love that AJA went all in on releasing a true cinema-style camera, they took a chance by releasing the CION with a standard PL mount instead of EF since most low-budget filmmakers already own Canon glass. The good news is that the PL mount can be easily removed to use third-party lens mounts for almost any lens. With a B4-mount adapter and a high-quality ENG zoom lens, because of its ergonomics, the CION can easily be used for sports or doc-style shooting.

Like most digital cinema cameras, the one thing you're going to need is a third-party viewfinder. Since EVFs are out of AJA's wheelhouse, it was smart of them to let you choose the viewfinder you're most comfortable with, whether it's the F&V SpectraHD 4 and Loupe Kit ($1,299) that AJA sent over with the review unit or the new Gratical HD Micro OLED EVF from Zacuto ($3,100).

Also, unlike a DSLR, you're going to need a third-party battery support system. I used an Anton/Bauer Dionic HC Lithium-Ion battery. Although more expensive and heavier, a professional battery solution is going to power your 4K workflow system, which is something you don't cut corners with.

Along with the EVF and battery system, another expense you may need to take on—especially if you shoot with cinema lenses—is a matte box. The CION doesn't contain an internal ND wheel system, so you're going to need ND filters to shoot in bright settings.

SETTING A LOOK

The CION's menu is simple and intuitive to use, but doesn't contain many of the bells and whistles a lot of new touch-screen menu systems have. But in regard to menu navigation, simple isn't a bad thing. To develop your look in-camera, there are six menu buttons that give you access to camera settings, which include STATUS, CONFIG, MEDIA, FPS, EI (Exposure Index) and WB (White Balance). To navigate through the menus, on the left side of the buttons, you simply press and scroll menu selections with a large, round knob.

Before you shoot frame one, it's wise to figure out which format is best suited for your project and whether or not you need to shoot 4K or UHD. AJA was one of the first companies to embrace an Apple ProRes workflow (the Ki Pro series all record ProRes). Using AJA's Pak Media, you can capture ProRes 4444 (up to 30 fps), 422 HQ, 422, 422 LT and 422 Proxy. In my experience, ProRes 4444 files are indistinguishable to uncompressed files, and the CION can capture ProRes files onboard. For this reason, I'm going to guess the majority of CION shooters will capture ProRes files rather than outputting AJA Raw due to cost factors. Compared with onboard capture from cameras like the FS7, you're actually recording a higher-quality codec in ProRes with more bit-depth than Sony's 10-bit, 422, 50 Mbps XAVC-I. (For my tests, I shot ProRes 4444 UHD files at 23.98 fps.)

The CION was built from the ground up as a digital film camera, so you have to set your exposure index value. One of the shortcomings of the CION is that it doesn't perform well in low light like many of the new mirrorless camera systems, such as the Sony a7S. Part of the reason why is that the CION

contains a global shutter rather than a rolling shutter. Like a film camera, with the CION's global shutter, you get a more accurate motion profile other than the jello effect you get from a full-frame-sensor camera with a rolling shutter. The CION offers EI values of 320, 500, 800 and 1000. In other words, you're going to need a lot of light. For narrative cinematographers, this is a given, but for doc-style shooters who work mainly in available light, the CION may not be the camera for you unless you shoot mainly daytime exteriors. For outdoor daylight scenes, I shot at 320. For indoor shooting, 800 held up pretty well, although at 1000 EI, it was difficult to get a good exposure with practical lights.

The next thing you have to take into consideration is your gamma setting, which is also found in the EI section. There you have a choice of Normal, Normal Expanded, Expanded 1, Video and Disabled. In the WB menu section, you can create a couple of looks in regard to color correction, including Normal, Flat, Skin Tones and Video. If you're a cinematographer who likes to set your look in-camera—bringing more control through the post pipeline—you're probably going to want to use the Video gamma setting with Skin Tone color correction, especially when working with actors. The Video gamma setting produces blacks and colors with a bit more contrast, and the Skin Tone color-correction setting produces less saturation in skin tone values for a more natural (less video-like) look. If you expose correctly and select the right color temperature, you'll save a lot of time in post.

If you're a filmmaker who will have ample time in post for color grading and you don't have total lighting control over your location (e.g., a contrasty day exterior), you'll probably want to set your gamma setting to Expanded 1 with Flat color correction. The Expanded 1 gamma setting increases latitude—similar to Sony S-Log and Canon Log—and lets you build the exact look you want in your color grade. The Flat color tool gives you less saturation while still providing a warm feel to your images. For my tests, I added warmth, contrast and a Cinematic 1 Lumetri Look in Adobe SpeedGrade.

POST WORK

The CION's post workflow was a cinch—simply eject your AJA Pak from your camera, insert into your Pak dock connected via Thunderbolt or USB 3.0 to your computer, and drag an "AJA" folder onto your desktop or external drive. If you captured ProRes files, you're good to go, with no need to do any transcoding. As I indicated earlier, shooting indoors at 800 EI, my captured image looked a bit underexposed, but I was surprised by the amount of shadow detail I was able to lift without generating too much image noise—far better results than a 4K DSLR's compressed H.264 or H.265 codec.

Unlike the Blackmagic URSA, Canon EOS C300 Mark II and ARRI AMIRA, instead of CFast 2.0 media cards, the CION uses the same AJA proprietary Pak media as the Ki Pro Quad system. At the moment, there's currently 256 GB ($695 MSRP) and 512 GB ($1,295 MSRP) SSDs available, plus the Pak Dock ($395 MSRP). This is pretty much in line with the cost of a CFast 2.0 card and cheaper than Sony's XQD cards. But because of the proliferation of cameras that employ CFast 2.0 media, the price of CFast 2.0 cards will drop consistently faster than AJA Pak media.

CONCLUSION

Just shooting with the CION for a few days, I can easily say it's one of the best low-budget digital cinema cameras I've tested. If you think of it more like a film camera—and less like a compact DSLR or mirrorless camera—you're going to capture truly cinematic images. At the moment, the cameras the CION will be most compared to are the Blackmagic URSA and the Sony FS7. (The upcoming Blackmagic URSA Mini also will be compared when it's released.) Although the URSA can capture Raw Cinema ENG files internally, its weight and ergonomics make it more of a studio camera not suitable for run-and-gun use. The FS7 ($7,999 MSRP) is a great 4K run-and-gun camera—it also includes an LCD/EVF—but what I like about the CION is its ability to capture ProRes 4444, as well as its native PL mount for professional cine lens use. (The FS7 contains a Sony E-mount.)

For $5,000 for the camera body, at the moment, there's simply no better indie camera around. Well done, AJA! HDVP

For more information on the CION, visit www.aja.com/cion.

CINEMA EOS V2.0

Profiling the new Canon EOS C300 Mark II and testing the EOS C100 Mark II

BY NEIL MATSUMOTO

Announced back in 2011, the Canon EOS C300 has been one of Canon's most successful video cameras since the launch of their Cinema EOS division, and at NAB 2015, they finally upgraded the camera to 4K. The EOS C300 Mark II is targeted at a broad range of shooters (cinema, documentary, event) and contains a new 8.85-megapixel Super 35mm CMOS sensor (twice the readout speed of the C300), new Dual DIGIC DV 5 processors and a new Canon XF-AVC codec that lets you capture 10-bit, 422 4K files internally. The camera also can record full HD (1920x1080), 2K DCI (2048x1080), UHD (3840x2160) and 4K DCI (4096x2160). Like the C300, the Mark II is great for low-light shooting and increases the amount of light that hits the sensor, lowering noise levels and supporting ISOs up to 102,400.

Another big new feature with the Mark II is the XF-AVC codec, which compresses 4K files to H.264 so they can be captured in-camera with CFast 2.0 memory cards. If you need a better 4K signal, you can simultaneously output uncompressed RAW 4K

Like the original EOS C100, the EOS C100 Mark II isn't much bigger than a DSLR, but gives you a true video camera experience.

through the camera's twin 3G-SDI outputs to an external recorder.

Canon Log has been one of Canon's secret weapons for filmmakers who need more dynamic range for color grading, and saves valuable time without the need to process RAW files (not to mention saving you valuable hard drive space). I'm excited about the Mark II's new log gamma curve, Canon Log 2, which can capture up to 15 stops of latitude. For professional cinematographers, the Mark II also supports both the ACES and new Rec. 2020 workflows, utilizing its MXF file structure. With MXF, the Mark II is also compatible with all of the professional NLE systems, as well as with high-end network systems used by production studios.

The new Dual DIGIC DV 5 processors power a lot of the Mark II's new specs and features, including bit-rates up to 410 Mbps, Dual Pixel CMOS AF, simultaneous 4K and HD proxy recording and 2K/UHD frame rates up to 120 fps. You can record 10-bit, 4:2:2 at all resolution settings, but if you only need to shoot 2K or full HD, like the C500, the Mark II also supports 12-bit, 4:4:4 color sampling for better color information.

One of my favorite Canon features is Dual Pixel CMOS AF. Compared to other AF systems, Dual Pixel focus pulls look very organic and "man-made." The C300 Mark II has a new version of Dual Pixel AF that expands the autofocus area to 80% vertically and 80% horizontally. It can also capture face detection with EF lenses, as well as Canon's STM lenses. Shooters can adjust the speed, tracking sensitivity, and specific size and location of the focusing area for better control, and there's a new feature called AF-Boosted MF, which gives you more stability.

Besides being a little heavier due to less plastic, the Mark II is similar to the original C300 frame, and it comes with a removable handgrip and an improved low-angle camera handle extension, giving you additional attachment points. Like the C300, the Mark II also has a removable LCD monitor with detachable cables and a control panel with XLR inputs. The C300 Mark II is offered with either a standard EF or PL lens mount, but can also be modified later by authorized Canon Cinema EOS service centers. (Yes, this will cost extra.)

The C300 Mark II looks like a true professional camera, and with 4K capability, the camera joins the ranks of high-end camera systems like the new ARRI ALEXA SXT, RED EPIC DRAGON and Sony F55. By the way, what's going to happen to the C500?

The Canon EOS C300 Mark II will be available in September 2015, with an MSRP of $20,000.

A DSLR KILLER

The Canon EOS C100 was announced back in late 2012 and became an instant hit among indie filmmakers who grew tired of DSLR workarounds. Last year, Canon released the updated C100 Mark II, a compact digital video camera that contains the same 8.3-megapixel Super 35mm CMOS sensor in all of the Cinema EOS cameras and the new DIGIC DV 4 processor. Like

LEFT: Unlike a DSLR, the EOS C100 Mark II gives you balanced XLR inputs, Zebras and Peaking functions, internal ND filters, a viewfinder and Canon Log. BELOW: The redesigned 3.5-inch OLED panel can articulate at any angle, making it easy to operate handheld.

the original C100, the Mark II isn't much bigger than a DSLR, but gives you a true video camera experience. The C100 Mark II also adds several groundbreaking features, including Dual Pixel CMOS AF as a standard feature, and a redesigned and much improved 3.5-inch OLED panel.

Canon sent me a C100 Mark II review unit that I used to shoot interviews and new products at NAB 2015. For my interviews, I shot with the C100 Mark II with an EF-S 10-18mm *f*/4.5-5.6 IS STM lens.

In my opinion—after using it for a week—the C100 Mark II is the best single-shooter video camera on the market. It's extremely lightweight like a DSLR, but unlike a DSLR, it offers balanced XLR inputs, Zebras and Peaking functions, internal ND filters, a viewfinder and Canon Log. Unlike compact Handycam-like camcorders, you have the advantage of capturing cinema-style shallow depth of field with the C100's Super 35mm sensor. Because of its 8.3-megapixel sensor, the Mark II has an effective pixel resolution of UHD (3840x2160).

If you're a single shooter, you should buy the C100 Mark II for two reasons—Dual Pixel CMOS AF and Canon Log. Although it doesn't have touch-screen AF like the Canon EOS 70D, the autofocus is consistent whether you're center-framed or using face detection tracking, although I recommend using an STM lens, which eliminates focus adjustment noise when recording. Mounting the C100 Mark II on a Manfrotto monopod, I actually was able to conduct interviews while still shooting, something that would be nearly impossible with any other camera. Even when the subject moved, the face detection locked in, and I never lost focus.

I also loved the redesigned 3.5-inch OLED panel. You can articulate the screen at any angle, as well as fold it shut so the screen won't be damaged during transport. You can capture nearly 100% field of view, as well as have access and control over your menus.

You now can record in AVCHD or MP4. I'm confused on the benefits of using AVCHD over MP4, but the bit-rates range from 24 to 35 Mbps, depending on your frame rate. For my workflow, I captured MP4 files at 23.98 fps, which have a bit-rate of 24 Mbps. Since it's still a 1080 camera, it would have been nice to offer the Canon XF codec (50 Mbps, 4:2:2), but besides 4K, a low bit-rate is perhaps the only feature where the Mark II falls short.

For my Canon Log workflow, I shot exclusively Canon Log at native ISO 850, protecting my highlights. Because of the low bit-rates of H.264, the files actually were much smaller than files I've shot with my 70D, which has a bit-rate of approximately 47 Mbps. I color-corrected the footage in Final Cut Pro X, applying a Rec. 709 LUT using the LUT Utility from Color Grading Central.

The Canon EOS C100 Mark II is available now with a retail price of $5,499. **HDVP**

For more information on the Canon EOS C300 Mark II and the EOS C100 Mark II, visit www.usa.canon.com.

From The Top

An interview with Canon's Managing Director and Chief Executive Masaya Maeda | *By Neil Matsumoto*

At NAB 2015, we got the chance to interview Masaya Maeda, Canon's Managing Director and Chief Executive, Image Communication Products Operations. In a small room above Canon's huge exhibitor space, Maeda gave us his thoughts on 4K, Cinema EOS, mirrorless cameras and DSLR lenses, as well as the new XC10 camera. He keeps his cards close to the vest.

HDVP: Happy to see that the C300 Mark II is offering 4K. On that note, what sort of future does the C500 have?

Masaya Maeda: There isn't anything I can say about the C500 at this point. We're currently investigating to see if we can take this product to the next level. We're looking into that now.

HDVP: When you say "next level," could we be seeing a more traditional digital motion-picture camera, like the ARRI ALEXA or the Sony F65?

Maeda: Yes, we're looking into this.

HDVP: Why has Canon been slow in transitioning to 4K for your DSLRs?

Maeda: Because we're slow (laughing). There are power consumption challenges, as well as heat issues, that we need to solve, so we're investigating what we can do right now. The DSLR camera will have to be compact in size because, if it becomes larger, it turns into a C300.

HDVP: One criticism of your DSLRs for video capture is the lack of a neutral or flat color profile. Will Canon Log ever be offered on your DSLRs?

Maeda: Yes, we're considering that, although I can't tell you what level that will be incorporated. In the future, we would like to bring that into our DSLRs.

HDVP: The mirrorless M-series is no longer available in the U.S., correct?

Maeda: When you look at the Canon sales companies, whether it's in the U.S. or Europe, they have the right to choose which products they want to carry.

HDVP: So it's a Canon USA decision?

Maeda: From a Canon Inc. perspective, we would like them to sell everything, but there are still a few stubborn people (laughing).

HDVP: We've seen the success of the Sony a7S and Samsung NX1 mirrorless cameras. Do you think there's a market for a Canon mirrorless 4K camera that doesn't fit in the Cinema EOS line?

Maeda: I think that's a promising product, but we don't like to imitate others, so I think it would be a slightly different product if we release something like that.

HDVP: One of the most innovative features in your cameras has been Dual Pixel CMOS AF. Have you received much feedback from filmmakers on the technology? If so, have they voiced their opinions on the effects the technology has had on film crews? Do you think it can potentially eliminate the focus puller?

Maeda: The Canon USA people have a better idea about feedback, but regarding the impression they've received, they're very pleased with the response. Although this technology has a high level of [focus] matching for filmmaking, it will still require a person who specializes in matching, so I don't necessarily think this will be the case. If only we could invent a camera that we could control with our brain, that could be the future (laughs).

HDVP: At the moment, STM lenses available aren't considered professional-quality lenses. Could we see STM lenses in the near future that have L-series- or Cinema EOS-like glass? Can they overtake USM lenses?

Maeda: Yes, there's that possibility, but the characteristics are completely different between the USM and STM, so in the near future, they will continue to exist separately and be used separately.

HDVP: What are your expectations with the new XC10, and how will it be used?

Maeda: We developed this small 4K camera so that the users themselves can figure out how to use it. We really want users to explore the camera, and we're looking forward to what they come up with. I hope that Canon USA is also exploring new ways that this camera can be used. Initially, my impression is that it was going to be suited for news crews.

NODE ON

Blackmagic Design's Fusion 7 lets you create your very own blockbuster

BY MICHAEL GUNCHEON

Once mentioned only in the realm of action-adventure or science-fiction films, visual effects are now a part of many other genres. Whether it's to achieve a special look, create set extensions, track, stabilize or simply add atmosphere to a scene, effects work these days can be just as important in a romantic comedy as it is in a space epic. With this change also has come a change in accessibility to visual-effects software. Previously, effects work was accomplished with expensive—and often custom—software running on specially tuned workstations. Now there are tools available to achieve your vision without breaking the bank.

When Blackmagic Design acquired eyeon Software, Inc., last fall, they brought into their product portfolio Fusion, an application with a long history of use in blockbuster films, from *Avatar* to *X-Men*. Much like their history with their Resolve color-grading software, Blackmagic Design has made Fusion accessible to all filmmakers.

Blackmagic Design released Fusion in two versions—Fusion Studio for purchase and Fusion for free download. I recently had the opportunity to test-drive Fusion 7 Studio. For the purposes of this review, unless specifically noted, I'll refer to both software versions as Fusion.

NODE-BASED

Fusion is a node-based compositing system. If you're used to working with timeline-based or top-down layer-based software, as soon as you

open the application, you'll notice that things are different. Instead of a default timeline where you lay in the scene you want to work with, you see a Flow Editor where you place your scene and add tools or effects as required.

The tools and effects are displayed as "nodes"—icons that can be wired together to achieve complex visual effects. You can add nodes easily in several ways, including using a large toolbar with buttons for commonly used tools. Each node has one or more inputs (determined by the type of node) and an output. For example, a Blur node has a regular input (for your footage), an Effect Mask input and a node output. To use the Blur node, once you've added it to the composition, you simply wire the output of your Clip node to the Blur node's input.

Wiring is done by clicking on the Clip node's output and dragging a connecting line to the Blur node's input. Or, if you highlight a node before you add a tool, Fusion will wire that tool to the highlighted node automatically. If you want to create a mask for the Blur, grab one of nearly a dozen masking tools and add it to the Flow Editor. Then take its output and wire it to the Effect Mask input on the Blur node.

I found Fusion's Flow Editor easy to work with. Fusion has two default display windows so you can view two nodes at anytime. This was useful when I was hand-animating masks: I could see the plain matte and also how it affected the composition. Additional floating windows, including output via an I/O card, can be added.

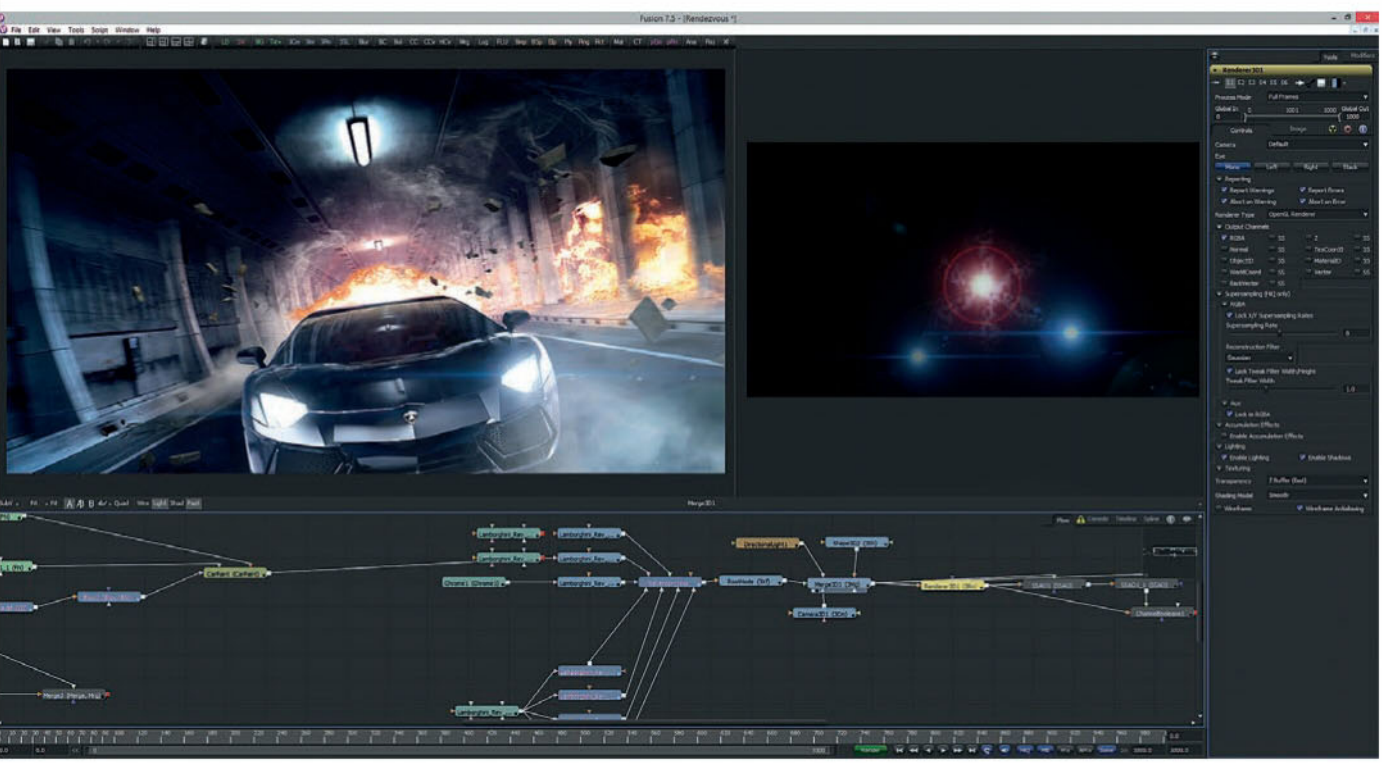
When working node-based, I found I was able to concentrate on the work I was doing and on fine-tuning the tool I was using. I wasn't trying to work on the whole shot.

When I worked with masks, I found myself making use of the convenient toolbars, under the display window, that offer quick access to various masking tools. Additionally, I found the ability to make an "instance" of a node very useful. A node instance differs from a regular copy because all instances share the same settings. For example, I had several instances of a Color Corrector node. When I adjusted one Color Corrector node, all of the instances changed.

Even though Fusion is a node-based system, animation isn't sacrificed. I had full access to keyframes and a timeline. The Fusion Spline Editor makes keyframe modification fast and easy, and I could also use motion paths to guide object animation on screen.

COMPREHENSIVE TOOLBOX

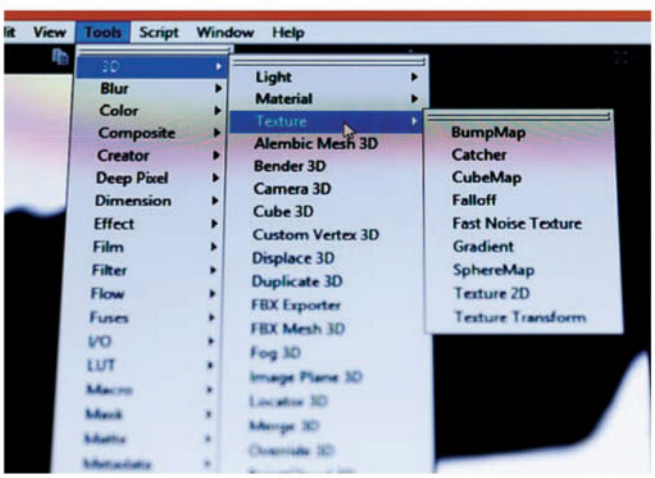
The toolset is overwhelming, at first, but that's not a bad thing. By my count, there are over 200 tools to choose from. There are the compositing tools that you would expect to see: blurs, glows, color effects, masks and several keyers, including Primatte. There are also 2D and 3D text tools with a "follower" feature that allow you to create text animations quickly. Warp and transform tools allow you to correct for lens distortion so composites can become seamless.



The paint tool is vector-based and can be fully animated. Combine that with some great rotoscoping tools, and you have a remarkable system for creating custom masks. There are even Flow Editor tools to help keep you organized when doing complex effects.

The Fusion particle generators work in 3D space to create effects like smoke or rain and allow you to apply force tools to simulate gravity, wind and even particle collisions. An expression tool allows for mathematical control of the properties of particles.

LEFT: For Fusion 7, tools and effects are displayed as "nodes," which are icons that can be wired together to achieve complex visual effects. BELOW, LEFT: Fusion has a number of 3D tools to create lights and shapes. BELOW: Color tools allow you to make color adjustments for any color channel or luminance range.



Photos courtesy of Michael Guncheon

In addition to particle generators, there are procedural creators that are useful for creating shimmers, clouds, water caustics (e.g., reflections) and plasma-style effects.

Trackers are built into Fusion so you can do tracking and stabilization, but you also can import tracking data from popular tracking applications like mocha and SynthEyes. For retiming, Fusion Studio can analyze and create optical flow data for use in speed changes. Once the optical flow data is created, tools like Time Speed and Time Stretcher improve the quality of pixel interpolation when retiming shots, making motion more fluid.

WORKING IN 3D

Fusion has a full range of nodes for working with 3D objects. You can create 3D shapes within the program, but just as importantly, you can import 3D objects, then turn to Fusion's 3D tools to light the object and work with 3D cameras to render the final composite. File import support includes FBX and Alembic geometry files. You can bring in camera data created in 3D applications like Maya or 3ds Max, and point cloud data can be imported for advanced tracking and camera moves.

Beyond lighting and cameras, Fusion has a number of 3D tools to make integration of 3D objects more realistic. The deep pixel tools include depth blur, fog, render, ambient occlusion and a (re-) texture tool. It's beyond the scope of this article to explain each one of these tools, but I'll give you one explanation. Depth blur can read Z-depth data in imported 3D objects and then apply depth-of-field-style blurs that automatically adjust blur, depending on how far an object is from the camera.

Fusion also supports OpenEXR files so you can add volumetric effects like mist and fog without having to go back to the original 3D project and re-render.

COLLABORATION AND SCRIPTING

Fusion 7 Studio includes Generation, a collaboration tool that allows shots to be parsed to different users. And if you're on Avid, you can send a layered clip from Media Composer right to Fusion. Scripting tools are built in for specific workflow customization.

FUSION 7 STUDIO VS. FUSION 7

While there's a difference between Fusion 7 Studio and Fusion 7, it's surprisingly minimal. Fusion 7, the free download version, doesn't have network/remote rendering, optical flow and stereoscopic tools, and third-party plug-in support. It works in resolutions up to UltraHD.

As you may expect, Fusion has a lot of advanced 3D features that may make you think it's geared to a specific kind of compositing work. However, I found it to be a very powerful tool that can tackle a variety of tasks, both simple and complex.

Currently a Windows application, the next version (Fusion 8) will be available on Windows, Mac and Linux later this year. Fusion 7 Studio retails for $995, and Fusion 7 is available for download at the Blackmagic Design website, www.blackmagicdesign.com. HDVP

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Eye in the Sky

The state of camera drones for film and television production

BY DAN BROCKETT

2015 is destined to go down in history books as the year of the drone. A quick scan of the floor at NAB revealed new, lower-cost, more advanced drone technology everywhere. As a producer, director or cinematographer, you may have merely a passing interest in drones, but your projects in the future undoubtedly will utilize them to capture shots that are barely conceivable today. Drones provide that sweet spot for placing your camera in locations that were never before possible, for significantly less money and simpler logistics than using full-sized aircraft. Drones are smaller, lighter and quicker to set up and use than long jib arms and Technocranes that typically max out at 15 to 30 feet in length.

BETWEEN TOY AND TOOL

A little research reveals that for a mere $89.99, you now can buy a Sky Viper Camera Drone Quadcopter from your local Toys R Us toy store. The Sky Viper is capable of flight up to 100 feet in altitude and is able to shoot up to 30 minutes of 640x480 standard-definition video or 25,000 still images. Think about the implications of this for a moment. For less than $100, you now can own a device capable of remote-control, unmanned flight while recording video and still images. While the Sky Viper is a toy, not a pro-quality tool, the fact that the same basic technology that recently cost tens of thousands of dollars is now available to anyone for such a minuscule cost means that drone technology finally has reached low-cost parity. Just as Moore's Law first applied to computers, then smartphones, the technical sophistication and the quality of images drones are capable of capturing will

Rudy A. Rodriguez

Matt Mosher

LEFT: Dan Coplan, SOC, of Sky Bandit Pictures, an L.A.-based drone company. ABOVE: An army of drones flying overhead at a Society of Aerial Cinematography event.

continue to rapidly increase as the cost continues to rapidly fall. Better, cheaper and faster are the operating principles in this technology evolution.

CAMERA COMPANIES ARE IN, TOO

The latest generation of pro-level drones is capable of carrying heavier payloads for longer flight times. The days of drones only being capable of carrying GoPros or small DSLR-type cameras have evolved to octocopters capable of carrying heavier cameras like the RED EPIC DRAGON. ARRI introduced the ALEXA Mini at NAB 2015, specifically aimed at productions that are shooting on the ALEXA and need specialized shots that only a drone can obtain. What we're seeing is maturity in how drones are deployed and used in all levels of film and television.

USING DRONES IN YOUR PRODUCTION

What are the practical aspects of successfully utilizing drones in your production? We checked in with several drone pilots and production companies on what it takes to put drones to work on projects from a producer's perspective. Not surprisingly, there are many other considerations that go well beyond technology. Drones, like any newer, popular production tool, have experienced a period where innovation eclipses practical concerns. For a time, using drones in production has been a bit of an unregulated free-for-all. Where does the line fall between hobbyists utilizing their $2,500 drone for some beauty shots for their production versus a professional drone company utilizing their $50,000 octocopter for dazzling shots of a car chase for a feature spy movie? The U.S. government, through the Federal Aviation Administration (FAA), recently has created new legislation and rules that will

Photos by Rudy A. Rodriguez

Robert Rodriguez, who heads the Society of Aerial Cinematography, sets up a DJI Inspire 1 drone. According to Rodriguez, some of the advantages of using drones for productions are fast setup and breakdown and quick relocation after initial setup.

directly affect your ability to utilize drones in your productions (more about Federal regulations and the Section 333 Exemption later).

Production insurance underwriters are working on standardizing policies to cover drone production. Anytime new technology like drones gains a foothold in film and television production, rules, regulations, safety concerns and workflow issues rapidly raise their heads. A valuable resource for producers to utilize in drone production is a newly formed alliance of camera drone users, enthusiasts and professionals. Founded in 2013, the Society of Aerial Cinematography (www.facebook.com/thesoac, twitter.com/@The_SOAC) is a new group that was initiated by aerial cinematography enthusiast Robert Rodriguez, who's also director of technical operations for Technicolor Creative Services in Hollywood.

"What we're doing is making sure that people have a central place to come to for information about drones and the practical aspects of using drones in production," explains Rodriguez. "Section 333 is the exemption you file under for commercial use of drones. In terms of the insurance, there's sort of a weird gray area. Most of the professional drone operators and companies carry their own insurance. When the FAA implemented their new drone regulations and procedures, there were originally only seven companies exempted for commercial drone use in production, but now we have over a dozen companies who are exempted for production use, and the market is growing."

DRONE REGULATION

Like many aspects of production, working with top-notch, professional service providers costs more than "doing it yourself." With professional results available with relatively low-cost drones in the $1,200 to $4,000 range, why would a lower-budget production want to hire a professional drone company? There are several considerations to take into account, the primary being compliance with the law. Under the letter of the law, the FAA prohibits the use of drones in commercial enterprises (this covers many other uses of drones besides production), other than under an exemption to the law, which is only granted to a dozen or so approved drone production companies/operators. The FAA allows the use of personal drones for "model aircraft operations for hobby or recreational purposes only." This is where producers often opt for the do-it-yourself model in order to save budget, even though under the letter of the law, production generally isn't a hobby or recreation, but a business.

There are risks to the do-it-yourself model that you need to become familiar with. Working with a Section 333-exempted drone company on a professional production requires the drone company to file with the FAA, obtaining flight plan permission, safety requirements, insurance and usually a team of two to four experts to safely coordinate and deploy the drone. Doing it yourself, producers often just will purchase a drone and camera system and start shooting with it. In the DIY model, there has been no notification to the FAA of flight plans, and a

nonprofessional drone pilot might exceed the altitude ceiling the FAA allows, putting regular aircraft at risk if they collide with the drone, resulting in an air disaster. A nonprofessional drone operator might also lose control of the drone, injuring or killing innocent people. Buying your own drone and occasionally using it for a quick shot may seem tempting, especially when budgets are tight, but the smaller, lighter prosumer drones that are the most popular tend to give the neophyte pilot a false sense of skill because they seem to be so easy to fly.

If you'd like to take a look at the hoops that a company or pilot must jump through in order to legally fly drones for commercial usage, the following link connects you to instructions for petitioning the FAA for the Section 333 Exemption, www.faa.gov/uas/legislative_programs/section_333/how_to_file_a_petition/media/section333_public_guidance.pdf. As of press time, there are currently about a dozen companies in the U.S. that are qualified, although it's probable that this number will grow as drones increase in popularity.

THE TEAM APPROACH

As you might imagine, while less costly than hiring a full-sized aircraft, employing a drone company and doing it the right way costs a considerable amount of money. Keep in mind, though, that professional drone pilots are highly skilled, and it's mandatory to have a drone pilot, separate camera operator and spotter on a professional drone team. This allows the pilot to concentrate on safely piloting the aircraft, avoiding obstacles and preventing dangerous or unsafe proximity to people, while a skilled camera operator optimizes the camera's framing to capture what the director desires, angle to the sun or other light sources, often riding exposure, sometimes utilizing follow focus, and monitoring battery and media usage. The Internet is well populated with YouTube videos and accounts of amateur pilots accidentally crashing drones. Besides the obvious expense of destroying expensive equipment, there are serious safety considerations to take into account. With the 2014 train death of a crewmember in Georgia while filming a Gregg Allman biopic called *Midnight Rider* fresh in everyone's mind, safety is now more of a consideration than it has ever been.

Drew Roberts is company founder, drone engineer and main pilot for Wild Rabbit Productions (wildrabbitproductions.com), a company that recently received their FAA 333 Exemption. Roberts explains, "We actually have an in-house producer who interfaces directly with all of the producers that we work with. Having somebody who can act as a liaison between the pilot team, the technical limitations of the gear and the producer/client's needs has proven to be a valuable asset for us. We want to be in early on during the preproduction process because it helps us to be prepared for whatever the creative challenges may be in obtaining the shots the director wants. Things have become much more complicated on our end. David Radin, our producer, is an FAA-licensed pilot who's familiar with charts, airspace, how the government works, pulling permits, getting our flight plans approved.

Katee Laine

Going Solo

3D Robotics introduces a smart drone right out of the box

By Neil Matsumoto

One of the most exciting new personal drones in the marketplace is the Solo from 3D Robotics. Armed with a GoPro HERO camera, the all-in-one drone has impressive computing power, with two integrated Linux computers–one on the drone and one in the controller–giving you control over your GoPro's controls, as well as wireless streaming to your mobile device or through your controller's HDMI port for live HD broadcasts.

One of the coolest features on the Solo is its computer-assisted Smart Shot technology, which lets you set up a complex shot (Orbit, Cable Cam, Follow and Selfie), tap "play" on the app, and Solo will execute the shot like a professional "cinema" pilot.

3D Robotics worked with GoPro in creating an advanced gimbal that gives you full control of your HERO camera. You can start and stop recording while your drone is in flight, as well as shoot stills and change field of view, frames per second, exposure and more. The 3-axis gimbal can stabilize the camera to within 0.1º of pointing accuracy and even charge your camera so the battery won't run out of juice midflight.

"Solo is a breakthrough in intelligent flight," says 3D Robotics CEO and former *Wired* Magazine editor Chris Anderson. "It's not just smarter so it can do more; it's smarter so you have to do less. We've turned the Hollywood toolkit into software, and allowed everyone to experience epic video, both behind and in front of the camera."

Solo can be purchased at over 2,000 retail locations, and pricing starts at $999. (The Solo gimbal is sold separately for $399.) Learn more at 3drobotics.com.

Photos by Drew Roberts

ABOVE: Drew Roberts of Wild Rabbit Productions likes to be involved early on in the preproduction process, and his company has an in-house producer who interfaces directly with the producers they work with.

Now that the FAA, the permit offices and local government are working together, it's getting smoother, but it can still be a challenge. We're constantly educating our clients about what can and can't be done."

DRONE ADVANTAGES AND LIMITATIONS

It's important that producers understand the reasons why one would want to use drones, as well as the limitations that drones have. "From a production standpoint, one of the main advantages of using a drone is fast setup, breakdown and quick relocation after initial setup," explains Rodriguez. "This allows for easy deployment in multiple locations in one day and allows for multiple takes in one flight. Drones generally require a small crew, and because drones are lightweight, the complete packages are fairly easy to travel with internationally, as far as air travel. Compared to traditional aircraft, drones are cost-effective, cause minimal disruptions on set and are extremely safe in the right hands. From a creative standpoint, drones allow for almost unlimited creative possibilities. You have your choice of fast, smooth compound camera movement in three axes, you can position your camera as low as five feet up to 400 feet above the ground, a drone can hover completely stationary or move at up to 30 miles per hour."

When asked about the limitations of drones, Rodriguez responds, "If dialogue is critical to the scene, the noise of the drone is too loud. If you need to capture the exact same take multiple times, drones aren't a motion-control rig, there are variances in the movement. Some talent aren't comfortable around drones, and you don't want to use a drone anytime there's a safety concern to cast or crew."

DIFFERENT TOOLS FOR DIFFERENT JOBS

Besides the crew and cost considerations, there are equipment decisions you need to make. You might think that a small, inexpensive camera like a GoPro HERO4 typically would be used only on small, lower-budget projects.

Dan Coplan, SOC, is the owner of Sky Bandit Pictures (skybanditpictures.com), an L.A.-based drone company. Coplan explains the differences between the sizes of drones he deploys for assorted types of projects, noting, "We have different drones to support a variety of cameras and productions. Cameras like the GoPro are often associated with and used for lower-budget projects, but even big-budget productions will use this kind of setup on a small quadcopter to put a camera where a larger camera and aerial platform won't fit, like flying through a window. The choice of camera and drone isn't always dictated solely by budget. The next step up is a hexacopter or an octocopter, typically used for DSLRs like the Canon EOS 5D Mark III, though the Panasonic GH4, with its smaller form factor, lighter weight, and ability to shoot 4K and slo-mo, has become a popular choice. Finally, you have the larger, heavy-lift octocopters in a flat-8 or X8 configuration that support higher-end digital cinema cameras like the RED EPIC and, most recently, the ALEXA Mini."

THE AGE OF THE DRONE?

Drones continue to grow in popularity. Taking a look at some of today's biggest TV shows and films reveals that producers, directors and cinematographers have quickly made drones an incredibly popular tool in production, perhaps even to the point of overuse. It remains to be seen if drones are merely a fad or if they will continue to be an essential tool in production.

Regardless of the outcome, as drones increase in features and quality while decreasing in size and price, visual innovators will continue to push the envelope by placing cameras in interesting and never-before-seen locations, hopefully defining a new visual aesthetic. HDVP

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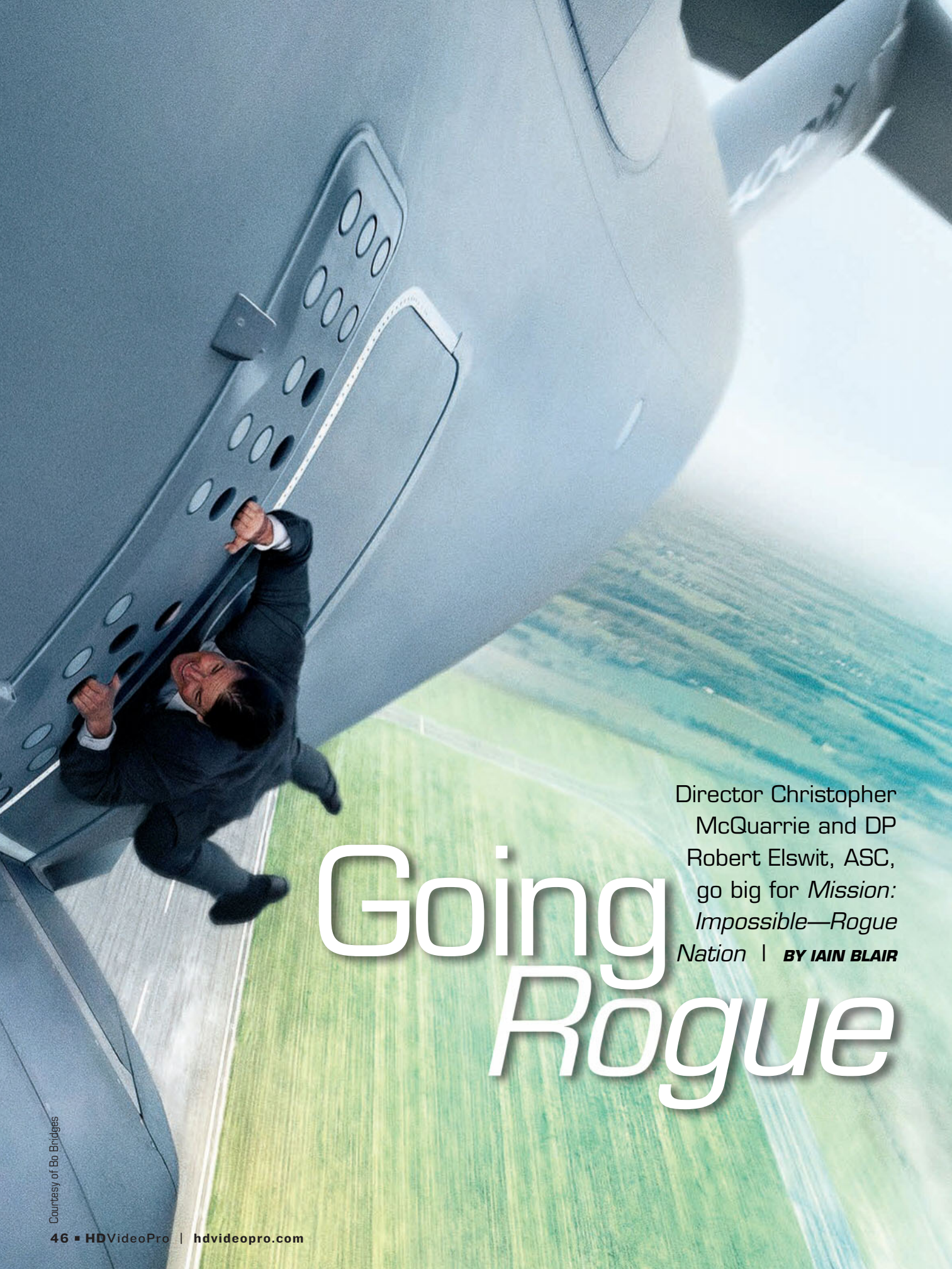

Going *Rogue*

Director Christopher McQuarrie and DP Robert Elswit, ASC, go big for *Mission: Impossible—Rogue Nation* | **BY IAIN BLAIR**

Courtesy of Bo Bridges

Tom Cruise has always prided himself on doing his own—often very risky—stunts. On the last *Mission: Impossible* outing, he blithely hurled himself off a Dubai skyscraper, which is the tallest building in the world. So when Christopher McQuarrie, the director and screenwriter of the latest installment in the multi-billion-dollar franchise, half-jokingly suggested that his star go for a plane ride—on the outside of an Airbus A400 military aircraft—Cruise instantly took up the challenge.

"We were looking for an exciting sequence that was going to be the finale, and we were living in the shadow of all the other *Mission* films and knew it needed some sort of big image," recalls McQuarrie. "I tend to design action based on locations, and this being the fifth in the series, it's hard to come up with something completely new. So when our production designer showed up with a model of the plane and I told Tom, 'Imagine if you were hanging off the outside when it took off,' without missing a beat, he said, 'Yeah, I can do that.' And that's how it happened."

It's one of many eye-popping stunts in the latest film, *Mission: Impossible—Rogue Nation*, which teams Cruise with newcomer Rebecca Ferguson alongside regulars Jeremy Renner, Simon Pegg, Ving Rhames, Sean Harris and Alec Baldwin. This time out, the IMF has disbanded, and with Ethan Hunt out in the cold, the team now faces off against a network of highly skilled special agents, the Syndicate. These highly trained operatives are hell-bent on creating a new world order through an escalating series of terrorist attacks. Ethan gathers his team and joins forces with disavowed British agent Ilsa Faust (Ferguson), who may or may not be a member of this rogue nation, as the group faces their most impossible mission yet.

The movie was shot by acclaimed cinematographer Robert Elswit, ASC, who won the Oscar® for *There Will Be Blood* and whose credits include *Inherent Vice*, *Nightcrawler*, *Michael Clayton* and the previous *Mission: Impossible—Ghost Protocol*. "Beyond all his gifts as a cinematographer, he brought an aesthetic look to the film, which was crucial," notes McQuarrie, who got his start with his acclaimed Oscar®-winning script for *The Usual Suspects*, cowrote the World War II thriller *Valkyrie* starring Tom Cruise and reteamed with Cruise on *Jack Reacher*. "And he was great as a third man alongside Tom and me. We'd rehearse a scene, and he'd ask very insightful story questions that would break us out of our comfort zone. Getting his POV was invaluable, as so much of it was done spur of the moment, and we were constantly rewriting the script."

"Chris isn't a director who's used to storyboarding and limiting himself to designing stuff way ahead of time, and like Tom, he likes to do stuff on the spur of the moment," says Elswit. "It's very organic, and while the *Mission* movies are genre in the sense that there's action and car chases and so on, it's very important to Chris and Tom that all that's centered around real human beings with real stakes—and that's tough to do. It's not just people winking at each other and looking for any excuse to blow shit up."

Rogue was shot on film with Panavision equipment and lenses, except for the complex underwater sequence that was shot with the new ALEXA 65. "We didn't consider going digital, as neither Tom nor Chris really like the look," says Elswit. "You can shoot digital and find a LUT that will mimic the film look, but they both wanted the real film look. And Tom just doesn't like the way digital capture looks, even when it's manipulated."

Shooting film also had the benefit of making post "far quicker," notes the DP. "It was originally scheduled for a Christmas release, and now it's a summer release. And, in a way, it's easier to find the look of the movie if you shot film initially. It's less labor-intensive in post."

The main unit camera package consisted of three Panavision Millennium XL2 camera bodies—A and B cameras, as well as one dedicated to Steadicam. "We also had Panavised ARRI 435 and 235 cameras," reports Elswit, a longtime user and fan of Panavision cameras and lenses, who's also fond of the anamorphic format for feature films. For *Rogue*, he chose the older, classic C-series anamorphics, which were then given a few contemporary "tweaks." "I felt that their look would be perfect for the film's visual style that director Chris McQuarrie and I were aiming for—a slightly stylized and very glamorous, old-fashioned look that's elegant and magical, but which still feels real," he explains. "It's really

BELOW: Director Christopher McQuarrie (pictured) and DP Robert Elswit, ASC, shot the majority of the movie on film with Panavision gear. BOTTOM: Rebecca Ferguson as Ilsa and Tom Cruise as Ethan Hunt.

Christian Black

Chiabella James

ABOVE: When McQuarrie half-jokingly suggested that his star go for a plane ride—on the outside of an Airbus A400 military aircraft—Cruise instantly took up the challenge.

the complete opposite of something like the *Bourne* movies, where everything is handheld and jittery. We wanted a visual style that recalled the stylish glamour of those classic Hollywood films from the '40s and '50s, and the idea was to make all the actors look as attractive as possible without feeling that there were movie lights everywhere doing that."

Lenses and stock played a key role in achieving that look and style, and the DP and his assistant, Erik Brown, note that the C-series anamorphics, when combined with shooting on film, give "a really pleasing natural big-screen feature film look." They're also relatively small and lightweight, "which is great when doing handheld Steadicam work or needing to make a camera as small as possible for tight spaces," says Brown. "Considering the age of the glass, they're sharp without being 'too sharp,' and they usually flare with a sexy classic blue line anamorphic flare, and their bokeh is really natural and pleasing to the eye."

The team put together two sets of C-series anamorphic primes—one set for A camera and one for B camera—with a "neutral look" not biased toward being warm or cool. "We wanted them to be as matched as possible so that cutting between the different cameras and shots would require as little help as possible in post," adds Brown. "This would also allow the film to have a very realistic natural look and any warmth or coolness that might be desired later could be introduced in post."

Assembling two matching sets wasn't easy for Elswit, who points out that the C series, unlike contemporary lenses that all meet exacting manufacturing and optical standards, are all uniquely individual and were hand-assembled—and are in high demand, like all of Panavision's anamorphic lenses. Lori Killam, Panavision's marketing rep for sourcing and scheduling the lenses, and Dan Sasaki, Panavision's VP of Optical Engineering, put the lens package together. Brown calls Sasaki "an anamorphic master specialist and all-around lens guru. No one knows the intricacies of optics like Dan. Several of the tweaks Dan did for us were to modify several of the middle and longer focal lengths to focus six inches to a foot closer than normal minimum focus would be for that given focal length. He also made sure that all the front elements of our C-series lenses had contemporary lens coatings, as we were often looking into the sky or bright backgrounds and often unable to set flags, and wanted to minimize the veiling, halation and flaring that would often happen in these situations with the coatings on original C-series lenses. Also, due to lens availability issues, Dan ended up hand-building several of the lenses for us, and the end result not only was technically wonderful, but visually fantastic, as well."

Sasaki also built a 25mm lens for the shoot "that was incredible, as it had the optical qualities of the C series and was as small, but had minimal barrel distortion, and the verticals and horizontals were incredibly straight considering its extreme wide-angle field of view," adds Brown. This lens was often used for establishing shots. Sasaki also modified a 60mm that would focus to 17 inches. "The 60mm is a well-used focal length in Robert's arsenal, and it was great to have one capable of very tight close-ups," Brown says. "We often used it for inserts, as well, because it was optically much nicer than using a diopter or macro."

Christian Black

David James

Most of the picture was shot on two Kodak film stocks—5213 (200 ASA Tungsten) and 5219 (500 ASA Tungsten). Elswit says he prefers to shoot in daylight conditions without an 85 filter and correct in the transfer, and the team used minimum filtration, in general, usually just neutral-density filters during day exteriors.

"The actual shoot was pretty straightforward," reports Elswit of the globe-trotting production that included locations in Morocco, Austria and Britain. "Often, it was hard to prepare much ahead, as they were still working on the final script during the shoot, but it went very smoothly considering all the location work and logistics involved." The DP adds that the shoot included a lot of Steadicam and "a lot of camera movement. Chris wanted to take a different approach from his last film, *Jack Reacher*, and so any chance we had to move the actors through space to create a dynamic, kinetic shot, we took. We didn't want a static, 'proscenium presentation' look to it. We wanted the actors and camera to be in constant motion."

Courtesy of Bo Bridges

With the camera often on a dolly, slider, car mount or crane, Elswit and Brown relied heavily on the Preston remote focusing system, "as it was often impossible to physically put my hand on a focus knob," says Brown.

In terms of lighting, Elswit says the team used "pretty much everything." For the big Vienna Opera sequence, the DP was able to use hard light, "and do it with very theatrical shadows, so we could create an artificial environment that you believe is real, and we went back and forth between the opera taking place out front on stage and what the actors were doing backstage. And it was very easy to create a kind of stylish, elegant look for both places that's not at all naturalistic. It's highly theatrical.

"For all the location stuff in Morocco and the action scenes, it's still all about lighting the actors well—feeling as if you're in a realistic environment with no artificial lighting going on," continues Elswit. "And that's one of the great challenges of lighting a movie like this—disguising the glamorous lighting and not calling attention to it. So the approach is the opposite of going with available light and a naturalistic style. And getting that glamorous look applies not just to Tom and all the actors, but to everything on screen—the sets, the wardrobe, hair and makeup, and so on. So, in that sense, it's a bit of a throwback to movies from 40, 50 years ago. It's a very fine line to tread."

Elswit reports that the biggest technical challenge on the shoot was the underwater sequence, which was shot in a tank at Pinewood Studios. "It involved this free-dive for Tom into an underwater chamber where he has to retrieve a device and then escape, and it took a long period of testing to figure out how to do it," he says. "It was a very complicated storyboard animatic design of the sequence, and we had to do it so the characters appeared to be moving through the water, holding their breath and doing all the things they did. The set itself was mostly a virtual set, so we did a lot of mechanical movements with Tom holding his breath underwater about 20 feet down. And then using the ALEXA 65 with a HydroHead to do very complicated camera shots to make it all look real and believable took a lot of planning. Some of it was done with real set pieces, but the rest was done with greenscreen, and the virtual set was added later in post."

Another tour de force set piece was shot at the Vienna Opera house, backstage. "There's a big fight in the lighting grid between Tom and a bad guy struggling over a gun while an opera is being performed," Elswit explains. "So we were shooting various stunts and action scenes 60 feet in the air, which was also a big technical challenge."

Because it was a film shoot, in terms of workflow there was no instant digital gratification—or even any certainty that a shot was in focus. Elswit and his team had to wait for the lab report and transfer report every morning to see if there were any problems. "The labs in London developed the film overnight, and in the morning the negative went to the colorist at Company 3 in London, who did a great job with the dailies, and I'd be sent frame grabs from all the work by lunchtime," the DP reports. "I'd comment on them, and they would do an ARRI scan with LUTs."

As noted earlier, post was relatively fast. McQuarrie completed his director's cut in barely five weeks, and at press time the film had largely been cut by editor Eddie Hamilton (*Kingsman: The Secret Service*), and the filmmakers were deep into the mix in London. VFX was done by Double Negative, "and they were the most time-consuming part of post," says the DP. "There was a lot more greenscreen than we anticipated."

Elswit did a "virtual DI" with Stefan Sonnenfeld from Company 3. "I've been in New York and L.A. while Chris has been in London, and we're able to both look at the material in real time and color-time it that way," he reports. "I did the same thing on *Nightcrawler*."

Summing up, Elswit calls the film "an exciting action film that takes place in this very glamorous world, and it's a movie-star movie that no one else really makes anymore. That's what Tom wants—but it's not out of vanity at all. He just wants to make a very classy, classic, stylish, elegant movie—at the same time featuring these amazing stunts and action beats. And I think it delivers." HDVP

Visit the film's official website at www.missionimpossible.com.

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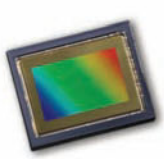

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Down on the Street

Shot entirely on a smartphone, filmmaker Sean Baker's brilliant *Tangerine* presents an alternative version of Tinseltown

BY NEIL MATSUMOTO

You saved up enough money to buy your shiny new 4K camera with 12 stops of latitude. So, now what? Camera specs alone (resolution, dynamic range, 10-bit vs. 8-bit, etc.) won't help produce a better movie. Filmmaker Sean Baker proves this with his feature film, *Tangerine*, a hit at the 2015 Sundance Film Festival, where it played in the NEXT category, which profiles low-budget films containing true indie spirit.

Shot entirely on the iPhone 5s, *Tangerine* has a unique look, with saturated colors, flat deep focus and blown-out highlights, similar to films from the DV revolution of the late '90s/early '00s. But, make no mistake, *Tangerine* isn't an iPhone gimmick film. Baker's story is inventive, and the performances he gets from his actors are hilarious and heartbreaking. In fact, when watching the movie for only a few minutes, you become completely immersed in the story and immediately forget the format the film was shot on.

Tangerine has a simple story. It's Christmas Eve in Los Angeles, and Sin-Dee (Kitana Kiki Rodriguez), a transgender prostitute, is on the lookout for her pimp/boyfriend. She learns from her best friend, Alexandra (Mya Taylor), that he was unfaithful to her while she was in jail. When she finds his "fish," aka mistress, she takes the woman captive, storming through the seediest parts of Hollywood, seeking revenge. There's also a side plot, telling the story of an Armenian cab driver who has a secret taste for the streetwalkers of Santa Monica Boulevard unbeknownst to his wife and mother-in-law.

After attending NYU film school, Baker made his first feature film, *Four Letter Words* (2000), shortly after graduation. Soon after, he became one of the co-creators of the cult comedy TV show *Greg the Bunny*, which ran on IFC, Fox and now MTV for 15 years. The success of the show enabled Baker to

make micro-budget indies (*Tangerine* is his fifth feature film).

For Baker, financing an indie film in today's marketplace—especially without A-list names—is next to impossible. After failing to obtain the budget he thought it would take to produce his movie the right way, Baker brought the film to Mark Duplass (*Togetherness, Jeff, Who Lives at Home*), who signed on as an executive producer to produce it on a micro-budget level. In terms of shooting on an iPhone, Baker says Duplass gave them the thumbs up early on and thought it was "very punk rock."

PRODUCING A SMARTPHONE MOVIE

Baker selected the iPhone 5s strictly out of budgetary reasons, as well as the fact that this was his fifth feature and he was basically out of favors. "Even with a DSLR, we would have ended up having extra crewmembers," he reveals, "and I would have had to find certain lenses, which I just didn't have the budget for. So what we did is just start looking at iPhone experiments on Vimeo, and we were very impressed by what we found. We realized that, instead of spending money on the equipment, we could put the money on screen on things like locations and having extras. I'm WGA and DGA, and we had a few union actors so, basically, we had to pay minimums to those unions."

ABOVE: Kitana Kiki Rodriguez, James Ransone and Mya Taylor shoot a scene in Hollywood. All photos courtesy of Magnolia Pictures

Instead of outfitting their smartphone with an array of accessories to make it more like a digital cinema camera, Baker and his co-cinematographer Radium Cheung went minimal and basically used one lens accessory, one app and one camera movement tool. For the film's look, they used the FiLMiC Pro app, a $7.99 iPhone video app that lets you control focus, aperture and color temperature, as well as capture video clips at higher bit-rates. They also used the new anamorphic adapter from Moondog Labs to capture widescreen. The lens adapter fits over the iPhone's native lens and squeezes the image to capture squeezed anamorphic images.

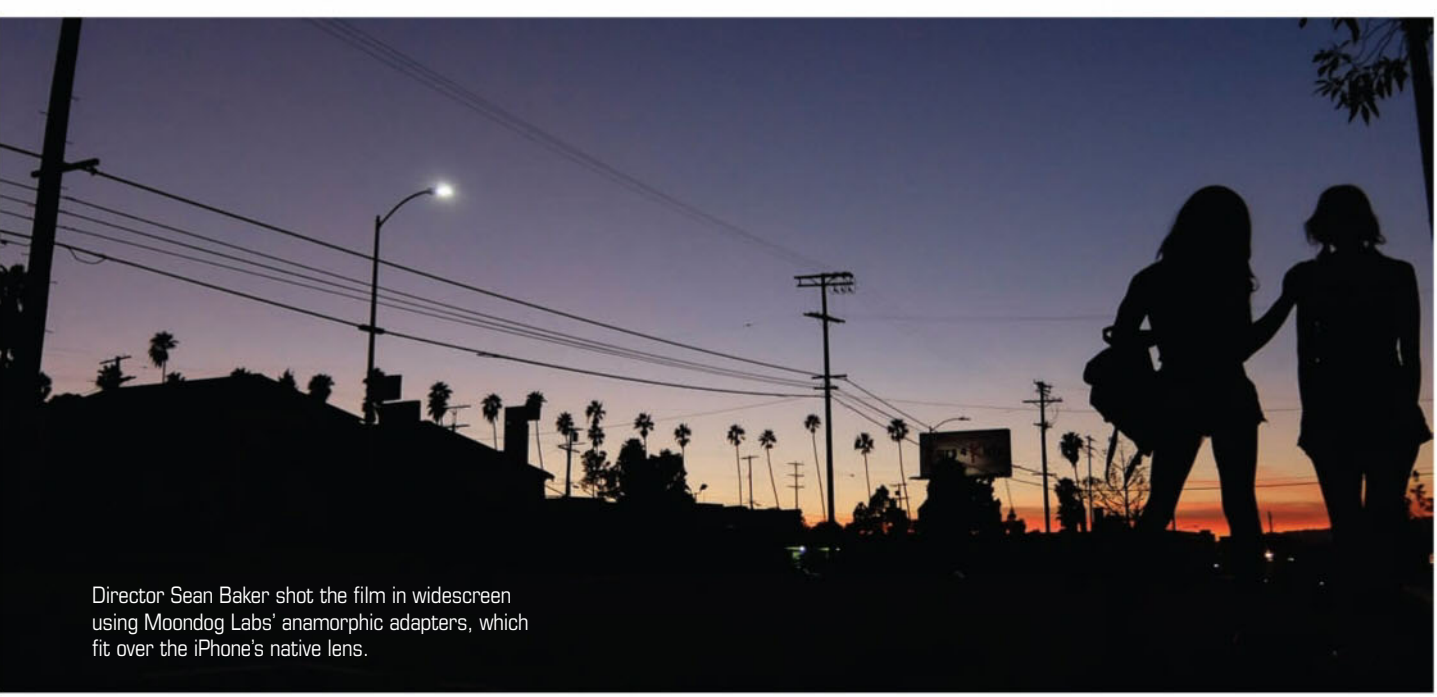
"They really were great for what we were doing, as they turn the phone camera into real anamorphic capturing devices," explains Cheung, in the film's press notes. "This gave the picture a much more classical film look. We were so lucky that the prototypes were made just in time and were available to us."

Another tool Baker and Cheung made great use of was Tiffen's Steadicam Smoothee, which allowed them to capture smooth moving shots without the shake normally associated with handheld video. "We also did stuff like going to the paint store and buying a 25-foot painter's pole and putting the camera on the end of it," says Baker, "capturing impromptu crane shots."

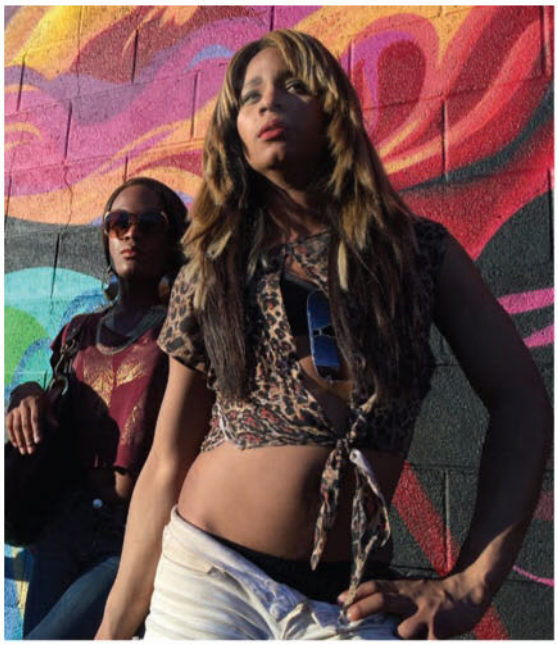
SHOOTING ON A SHOESTRING (IN HOLLYWOOD)

One of the most fascinating aspects of the production was that Baker's locations weren't locked off. He shot entirely on location in busy donut shops, West Hollywood clubs, city buses and Hollywood streets. According to Baker, because of their small footprint, most people had no idea they were shooting a feature.

"The only thing that gave us away was our sound department,



Director Sean Baker shot the film in widescreen using Moondog Labs' anamorphic adapters, which fit over the iPhone's native lens.



TOP, LEFT: Baker and his co-DP Radium Cheung made use of a Steadicam Smoothee for moving shots. TOP, RIGHT: *Tangerine* Director Sean Baker. ABOVE, LEFT: Baker took the look of *Tangerine* beyond "broadcast legal" levels. ABOVE, RIGHT: Baker shooting a scene with soundman Irin Strauss.

and that was only one person, Irin Strauss," explains Baker. "He's a wonderful sound guy, but his equipment was way more expensive than our cameras. We would usually put him around the corner, where he would be less visible to pedestrians. If there was a fire truck going through the scene, we embraced it—the more chaotic, the better. And if people didn't know we were shooting, we would wait until the end of the scene, run after them, and say, 'You were just caught on camera, could you sign this release?' I've learned that if you approach people the right way and you're nice, they see it as an artistic endeavor and everything usually works out."

But being nice wasn't always successful, as Baker recounts a story where there was one person on a bus who was savvy to the business. "Because we're in L.A., he knew that this could wind up anywhere, so he tried to charge us $80 for his image to be on camera," says Baker. "We offered him $20 and he countered with $40. Even though it was a great take, I killed the shot. I know that sounds so petty in the real world because what's $40? Anyone in the industry would laugh that off, but when you're dealing with such a tiny budget, you can't let things go like that because $40 would actually buy you lunch that day."

Some of the more "seasoned" actors were taken aback at Baker's casual style of shooting, but perhaps the greatest strength of *Tangerine* was the performances of its two leads—Rodriguez and Taylor, both newcomers to acting. (Rodriguez worked at an HIV/AIDS research center as a health educator and Taylor is a singer/performer.) The production worked with a script, but Baker refers to it more as a "scriptment" (half-script, half-treatment), which ran roughly 70 pages. A particular scene would read that the two leads walk down Santa Monica Boulevard and talk about past holidays. Sometimes they would lock down the dialogue and other times it would just be a description and the actors

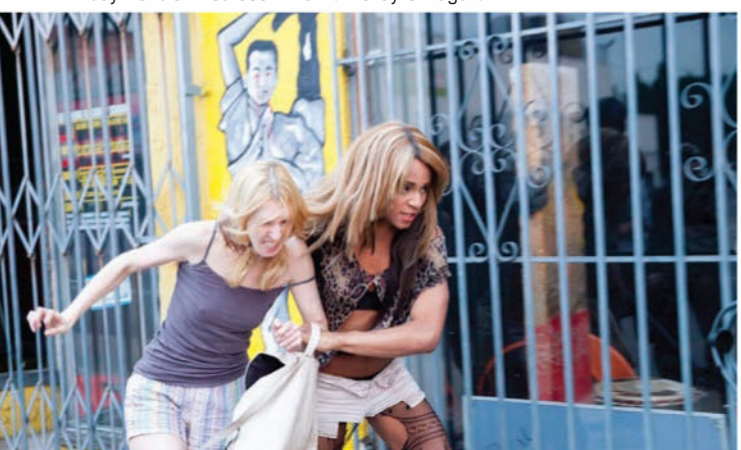
would improvise. Baker recorded all of the rehearsals and had them transcribed so the actors could have reminders on set before shooting the scene. Many of the scenes between Rodriguez and Taylor were shot in a widescreen two-shot, which gave them more freedom with dialogue and blocking.

"It was a very collaborative effort altogether because I'm not from that world," explains Baker. "And I feel that the only respectful and responsible way of making films like this is to get the voice of the people who are closest to that world. In this case, Mya had many friends who actually worked that area."

One of the strengths of working with a smartphone is that nearly everyone has one, so most people feel comfortable in front of one rather than a monster-sized digital motion-picture camera on a dolly. According to Baker, on day one, or even minute one, the intimidation factor was removed and his two leads were on the same confidence level as "professional" actor James Ransone (*Low Winter Sun*, *The Wire*).

"There was a huge benefit of being an inconspicuous unit," reveals Baker, "and if we shot it a year and a half from now, we probably would have the iPhone on a drone."

BELOW: Sin-Dee (Kitana Kiki Rodriguez) takes revenge on her pimp/boyfriend's mistress Dinah (Mickey O'Hagan).



A "TANGERINE" LOOK

Post is where Baker really developed the look of his film, completing a preliminary look in Final Cut Pro and sharing it with his colorist, who was working in DaVinci Resolve, using contrast and saturation for the film's unique look and power windows to illuminate faces. Instead of following the trend of many social-realist films, in which they drain the color for "reality," Baker pumped up his saturation beyond "broadcast legal" and began to see the "tangerine" hue of L.A.'s sunlight. "These women's personalities were so colorful," says Baker. "Why are we trying to drain the color from this colorful world? Let's go the other way."

Continues Baker, "People were coming up to me at Sundance and saying how much they loved the look of the movie. Anderson Le from the Hawaii Film Festival came up to me and said he loved the way I made Los Angeles look 'radioactive.' Now that's an interesting way of putting it."

With *Tangerine*, Baker and team proved that a camera alone doesn't make a production. Working on a shoestring budget with a smartphone in the middle of Los Angeles may seem like a gargantuan feat, but working with talented non-professional actors like Rodriguez and Taylor with an unobtrusive camera was a liberating experience, with results you won't find in most Hollywood movies.

"I never like talking about my actors where I call them non-professionals because the industry takes that wrong," says Baker. "They hear non-professional, and they think unprofessional, but both Mya and Kiki come from backgrounds where they had studied acting—it was just their first time in front of the camera. They're both trying to parlay this into full-time careers in entertainment, and it's my hope that this film helps them get there." HDVP

Tangerine *is distributed by Magnolia Pictures. Visit the film's website at www.magpictures.com/tangerine.*

Justice Is Blind

Cinematographer Matthew Lloyd creates a bold and dark look for Netflix's *Daredevil* | BY IAIN BLAIR

Sick of the same old superheroes?

Bored with predictable caped crusaders and avengers? Don't despair. Do yourself a favor and watch *Daredevil*, the gritty, excellent new Marvel live-action series on Netflix that follows the adventures of attorney Matt Murdock who, in a tragic accident, was blinded as a boy, but imbued with extraordinary senses. Using his heightened powers, Murdock sets up practice in his old neighborhood of Hell's Kitchen, New York, where he now fights against injustice as a respected lawyer by day and masked vigilante by night.

Starring Charlie Cox as Murdock/Daredevil, Deborah Ann Woll as Karen Page and a genuinely menacing Vincent D'Onofrio as villain Wilson Fisk, the 13-episode show is shot with an artist's eye by Emmy®-nominated DP Matthew Lloyd (the TV series *Fargo*, *Project Almanac*, *Justin Timberlake: TKO*, *Robot & Frank*), who brings enough atmospheric moodiness to the dark visuals to make the *Dark Knight* trilogy look like it was shot on a bleached-out sunny afternoon.

"The great thing about the show's look is that, right from the very start, Marvel and Netflix not only embraced the dark, cinematic approach we took, but kept true to that vision throughout—and kept pushing the envelope the whole time," reports Lloyd, who actively pursued the project. "All the direct-to-TV delivery scenarios hadn't really been on my radar before, and I wasn't this huge superhero fan, but when this came up, my rep, Louiza Vick, and I reached out to Marvel, as it looked like a very exciting, interesting project, with a great opportunity to give the material a very different look from the other Marvel stuff."

Once onboard, the DP immediately found himself facing even more than the usual challenges with schedule and time. "We had an incredibly short prep—just three weeks—for a show this complex, with all the fight scenes and stunts we had to deal with," explains Lloyd. "That's unconventionally short, and we shot the first two episodes back-to-back. On top of that, on a show of this scale, you usually have a second DP that you can tag-team with on prep and the shoots, but that's not how it was set up. Marvel was adamant that I did it all, to keep the look

Photos by Barry Wetcher

and visuals consistent because of the relentless action, on every page, which all had to be carefully planned out and lit and photographed, and, of course, coordinated with wardrobe and costume and all the other departments involved. It was a pretty big undertaking."

In addition, Lloyd notes that "about 85 percent" of the show consisted of night shoots and a lot of location work in New York City, "which was another big challenge. We did do some stage work, but all of the location work and the lighting—sometimes of two or three city blocks—took a lot of prep and planning."

Demanding as this was, the DP says the visual approach fit right into the studio's initial mandate for the show, which was "to go for a very bold, dark, dynamic and ultra-real look, which is a very different look for this kind of material," Lloyd points out. "Thus, you would think that, midway through, the producers and executives would get cold feet when they see the initial footage and start pulling back a bit. But Marvel was totally committed to the look and never looked back, and gave us free rein to run with it."

The original cover of the comic book "Daredevil: The Man Without Fear." Courtesy of Marvel/Netflix

The DP adds that the stress and demands of keeping up with a punishing schedule "and shooting on the streets of Manhattan at night, to keep it real, and lighting whole city blocks, was pretty tough, but Phil Abraham [*Mad Men*, *Orange Is the New Black*], who directed the first two episodes, really embraced the style, as well, and everyone understood what was needed to make this work."

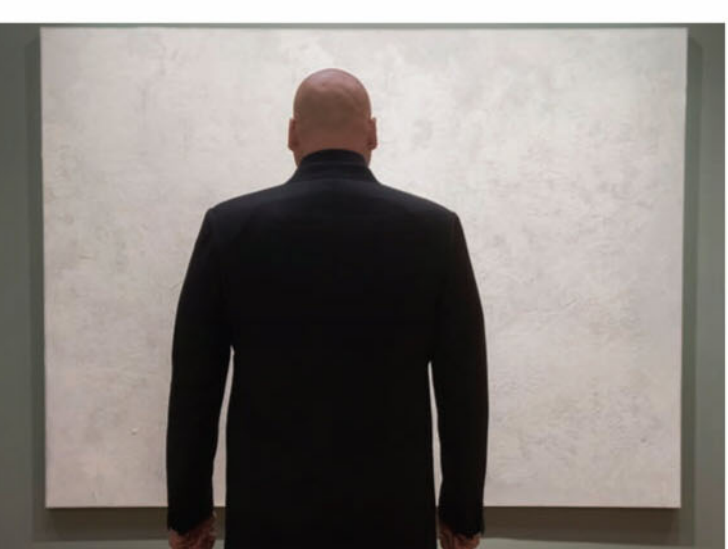
Lloyd shot the entire first season of 13 episodes with RED EPIC DRAGONs. "Netflix has

Courtesy of Netflix

adopted UHD, a compressed 4K delivery system, which is a streamable 4K resolution format, and the EPICs were the only real choice for doing this show," he explains. "And not just in terms of the format, but also in terms of all the rigs and mounts we had to use. To be honest, I find the RED footage is often very tricky in very low light if you want a solid black, but I knew they'd work well for the look, and so I wasn't worried about using them." The DP and his crew shot with three DRAGONs most of the time, "although we used up to seven, as we had another three or four for covering all the big fight scenes and stunts."

In terms of lenses, Lloyd notes wryly, "Like every other DP, I've worked my way through all the various options over the years, but I really love the Zeiss Master Primes. They're a very dependable optical system, and I've used them a lot in my past few jobs and always got great results. They give me the same image on every job, and assistants can count on what they see, even at T1.3. And they gave me the same great results on this show."

For the DP, the challenges of lighting the show was the area he was "most involved in. My camera crew, led by longtime focus puller Marc Hillygus, are all very self-sufficient. They have been with me long enough that they can just get on with the job, and even if I'm not operating, I'm always close by if they need me," he notes. "But the lighting on this show was a huge undertaking, and the goal was to be reasonably practical and not give everything that overly glossed look. Again, the idea was to keep it looking very real and gritty as much as possible."



Barry Wetcher

Lloyd matched or replaced existing practical units with large-scale movie lighting, "as, in the stunt scenes, you're bouncing into high-frame rates and doing all kinds of stuff where you need a healthy, deep enough T-stop so you have flexibility with focus and frame rate," he states. He used a lot of customized Par lamps with sodium globes, along with Condors and gel combinations "that really mimicked the sodium- and mercury-vapor industrial lights and the night look of streets in Manhattan," he reports. "And you want to see those fixtures and shoot the lamp itself, for that real quality, and then also augment from there." Los Angeles-based company T Pars supplied a mixture of lights, including "incredible" 12K Pars that can house sodium- and mercury-vapor globes. Lloyd also used a lot of ARRI Studio T12 Fresnels, "which are a cleaner source, and we'd gel them with a primary orange gel, LEE 129, the closest thing I've found to creating that sodium-vapor look."

SourceMaker Lighting Balloons in New York provided "a ton of balloon lights, used hanging off cranes or Condors, along with some of their new LED blanket lights, which come in varying sizes of clusters and which are great for localized lighting," he notes. "And that was our whole approach, to keep it very localized. So when an actor steps out of a pool of light, they're gone."

Talking about the workflow on set, the DP stresses that he always uses a DIT on set, "but for very different reasons than most DPs," he adds. "I don't actually spend a lot of time with the DIT, because of time constraints, but I know he's back there with a large, properly calibrated monitor as my second set of eyes, and you really need the DIT when you're doing all the huge fight scenes and so on to maintain the technical qualities. Basically, you can't do a complex show like *Daredevil* just sitting

in a tent with the DIT. And you also can't do a show like this without a DIT or you'd end up wasting about 10% to 15% of your footage." Lloyd reports that he used Patrick Cecilian, "an old friend and a top DIT, who did a great job."

Notes Lloyd, "It's a film-style workflow, as I use a dailies colorist, Kevin Krout, but I'm not actually grading and transcoding dailies on set. Everything goes to Deluxe and Company 3, where I've done projects for many years, and I use incredible dailies colorists who are super-tuned in to what the look of the show is and how it should be. I grade films like old-school on my laptop, adjusting curve and color balance to give them an idea, and then I call them every night and get stuff back in the morning, so it's a separate entity. Dailies is almost its own thing." The show was shot in REDCODE RAW 5:1 in 4K to accommodate the most frame rates without shifting resolutions.

The show was edited by Jonathan Chibnall, Monty DeGraff and Michael Knue, with visual effects done by Shade VFX, and Lloyd was "pretty involved, as usual" with post, which was all done at Encore Hollywood. "Once the actual conforms are done and all the edits have been approved, the raw material, plus the CDL files from my dailies guy, are sent to Tony D'Amore, the final colorist at Encore," he reports. "He did *Fargo* with me, and he's very knowledgeable and experienced, and does all the final DI work. We have a very close relationship, and we'd do a lot of digital sessions where they can actually stream the sessions to New York and I can give them notes. And all the dailies were incredibly precise, so that was great for him, as he could see more of a polished image than he was used to because of the work Kevin and I were doing in dailies. From that, he would do a pass, I would watch it and send him notes, and then he'd finalize my pass, and then the producers would come in and give us their notes.

"It's been incredibly physically challenging—more so than anything else I've ever done," sums up Lloyd. "And that's largely due to such a relentless amount of action and stunt work in every scene. But when you have a studio and creative heads all supporting the vision, and not being fussy about the audience and how they might react negatively to how the show looks tonally, then you can actually do some amazing, truly cinematic work on a show like this. And that made this whole experience so exciting and this show so special." HDVP

To watch **Daredevil** *on Netflix, visit netflix.com.*

Photos by Barry Wetcher

BROKEN

Filmmaker Matthew Heineman examines the line between good and evil for *Cartel Land*

BY NEIL MATSUMOTO

Trying to make a documentary about the drug war is a near-impossible feat. Mexican drug cartels have existed for decades, with both Mexican and U.S. governments trying to limit the violence on both sides of the border. During Felipe Calderón's administration (2006-2012), the official death toll of the drug wars was at least 60,000, with at least 27,000 missing.

A hit at the 2015 Sundance Film Festival, *Cartel Land* is a fascinating, yet disturbing examination of the path of two vigilante groups—one American and one Mexican—who are both battling against the violent drug cartels.

All photos courtesy of The Orchard

BORDER

Filmmaker Matthew Heineman, who won the directing award and cinematography award (along with co-cinematographer Matt Porwoll) at Sundance, tells two stories in two different locations. One is in the Mexican state of Michoacán, where Heineman follows Dr. José Mireles, aka "El Doctor," a real-life physician who leads the Autodefensas, a citizen group fighting the violent Knights Templar drug cartel that has been terrorizing his region for many years. On the other side of the border in Arizona's Altar Valley, Heineman profiles Tim "Nailer" Foley, a U.S. military veteran, who leads a small vigilante group called the Arizona Border Recon, which tries to stop, or slow, the Mexican drug cartels in delivering drugs across the border.

BORDER-BOUND

Heineman is a self-taught filmmaker who didn't take the traditional film school route. His first feature film, *Our Time*, told the story about the state of America's youth. The experience ended up being his film school as he taught

himself the craft while making the movie. When finished, Heineman was able to get HBO to look at the film, and although they didn't buy it, they hired him to help on a project they were working on, which jump-started his career.

After making a well-received documentary about our health care system, *Escape Fire: The Fight to Rescue American Healthcare* (2012), Heineman wanted to make a different, "more experiential" film. "I read this *Rolling Stone* article, "Border of Madness" by Damon Tabor, which featured the Arizona vigilantes," explains Heineman. "The minute I read it I knew I wanted to make a film on the subject. I knew little about the border, little about

ABOVE: Director and co-cinematographer Matthew Heineman.

LEFT: Members of the violent Knights Templar drug cartel that have wreaked havoc in the Mexican state of Michoacán for years.

the drug war or vigilantism, but these were all things that fascinated me."

After spending a few months talking to and following Tim Foley, Heineman's father sent him an article about the Autodefensa organization in Mexico. Heineman knew almost immediately that he wanted to tell that story, as well, and shifted the production in telling a parallel story of vigilantism on both sides of the border. Although it took several months gaining the trust of Foley, for Mireles, Heineman says that they talked on the phone and, two weeks later, he was shooting in Mexico.

Before and during filming, Heineman had no preconceived notions or goals on what his film was going to be about. "I'm not a huge fan of agenda filmmaking," says Heineman. "Obviously, the minute you turn your camera on, or change angles, you're injecting subjectivity, but I really wanted to be a blank slate and follow the story where it took me—obviously, it took me to some pretty crazy places, especially in Mexico, where you had guys in white shirts fighting against guys in black hats. Over time, I realized that the story was changing and shifting, and that it became much more complicated."

THE RIGHT TOOL FOR THE JOB

For *Cartel Land*, Heineman shot the film with Canon EOS C300s. One of the reasons why he chose the C300 was because co-DP Porwoll already owned one, so Heineman purchased an additional camera for himself. He and Porwoll shot the whole film in Canon Log because they wanted to capture a "flat" cinematic that would give them more latitude to color-grade in post.

"But, most important, for me, was that,

ergonomically, it was the exact camera I needed to go and make this film," explains Heineman. "Given its size—I'm not a big fan of DSLRs—I wanted something slightly bigger, but I didn't want a full ENG rig. The C300 was the perfect size for what I knew I'd be getting myself into, such as riding in the back of cars and operating on the fly. We also needed a camera that could shoot in low light, and the C300 is fantastic in that regard."

The production adopted an extreme run-and-gun (literally) style, as Heineman shot alone for intimate cinéma vérité scenes. For large crowd sequences, they shot with two cameras, and Porwoll shot all of the interview scenes. They typically would have a lavalier on their main subject and a shotgun mic on the camera. They didn't employ a sound person, but occasionally, Heineman's translator would record wild sound off of a Zoom audio recorder. Also, Heineman didn't use lights, except for interviews where he used them primarily for fill.

For lenses, Heineman says he shot predominantly with the Canon EF-S 17-55mm because "it's a lightweight lens that's ideal for vérité shooting." He also shot with the Canon EF 24-105mm and stayed mostly wide. The 17-55mm is an $f/2.8$, which was a bit too shallow wide open, and the 24-105mm is an $f/4$, so he and Porwoll shot mainly at an $f/3.5$ or $f/4$ for most of the film to create a consistent look. When asked if it was difficult keeping proper focus on still lenses for motion capture, Heineman revealed it wasn't an issue. "As a shooter, it's something that you're able to do, or not able to do," he says. "Obviously, we were in crazy situations, but I think finding focus is inherently part of the job of being a shooter so, for me, it wasn't that difficult."

NERVES OF STEEL

Crazy situations is almost an understatement for the type of shooting required when Heineman found himself in major combat, including a sudden shoot-out from the back of a car. For documentary shooters, one of the most difficult things to do is to keep your nerves in check while chaos surrounds you. Legendary photographer Robert Capa, who captured iconic images during D-Day, said, "If your pictures aren't good enough, you aren't close enough."

"I'm not a war reporter, nor have I ever been in a war zone," explains Heineman, "but I've found that shooting action actually calmed me down. I feel like if I was just the director I'd be probably freaking out, but I found that the actual craft of shooting—to keep my mind on proper framing, focusing and exposure—kept me focused. But, obviously, you have to be aware of what's happening around you, and I was always cognizant of my own safety—as much as I could be."

SHOOTING FOR POST

Working with DSLRs, you're working with limited dynamic range, which

limits what you can do in post. For Heineman, working in Canon Log greatly helped him deliver the look he wanted in post. Canon Log is a gamma setting that affords you much wider latitude in your shadow and highlight detail. But unlike RAW files—which entails more processing power and storage—since Canon Log is a gamma setting, you don't have to change your workflow, such as outputting to an external recorder. (The C300 uses the XF codec, which can be captured to CF cards.)

Heineman thought the Canon Log files held up great. "At first, when looking at the files, I thought, 'Do we even need to color-correct?' and I sort of fell in love with that flat-like look," he explains. "We ended up working with a really talented colorist, and we tried to keep that neutral look in the grading. It held up really well, and you could basically shoot anytime between 10 a.m. and 6 p.m., and we wouldn't have to do any color correction to make it match with the light.

"And, obviously, the sun-drenched conditions were difficult to shoot in, and I think one of the most important things I needed was the viewfinder," continues Heineman. "I don't think it's possible to shoot with that camera outside without the eyepiece, in terms of judging exposure and focus. We also had a variable ND filter, which gave us six stops so we didn't have to change ND filters, and it allowed us to shoot seamlessly in different conditions and locations."

ABOVE: Shooting in a literal "run-and-gun" style with a Canon EOS C300, director/co-DP Matthew Heineman often found himself working in some dangerous situations.

After its successful Sundance screening and additional film festival screenings (including Full Frame Documentary, Dallas International, Tribeca and Seattle International), *Cartel Land*, distributed by The Orchard, hit U.S. theatres on July 3, with screenings in Mexico to follow soon after.

"It has been quite a journey in making this film," concludes Heineman. "It's really wonderful to see how people from Mexico have reacted to the film, and I can't wait to release the film down there, as well. I fell in love with Mexico, as well as with the people, and I'm excited to see how the film is received down there." HDVP

For more information about* Cartel Land, *visit www.cartellandmovie.com.

LaCie's Rugged RAID is a great solution for video pros who work in the field a lot, providing both speed and security.

Tough Drive

LaCie Rugged RAID

By Michael Guncheon

The need for large, fast and portable storage increases every day as resolutions climb to 4K and beyond, and more and more recording is done in RAW mode. LaCie has been a big part of the storage solution, and their new LaCie Rugged RAID is a prime example. Far from being just another portable drive, the Rugged RAID combines two high-speed drives enclosed in a specially designed case. It offers high performance, both in terms of speed and security.

The Rugged RAID is available in a single configuration: two drives, each of which is 2 TB in size. The Rugged RAID can be set up for RAID 0 or RAID 1, but the array comes set for RAID 0. This mode combines the two drives to give 4 TB of storage and its fastest speed.

You can switch the RAID configuration to RAID 1 via two small buttons that are accessed using a paper clip. One button selects the RAID mode and the other confirms the selection. This two-button method prevents you from accidentally changing the RAID mode, which would wipe out any data already on the drive.

When set for RAID 1, the drives are "mirrored": data is duplicated across the two drives as it's written to the array. If one drive fails, you'd still have all of your data. Just as with any RAID system—the Rugged RAID or any other—RAID 1 sacrifices speed compared to RAID 0.

Connection to the drive is either via Thunderbolt, using the integrated cable, or via USB 3.0. By "integrated," I mean that the Thunderbolt cable is permanently attached to the drive. When not in use, the cable wraps around the case, fitting into a slot on three sides. The connector is then nuzzled into the end cap, which covers the end of the drive. The Thunderbolt connection doesn't need additional power, but the USB connection requires power that's provided by the included power adapter.

Since "Rugged" is its middle name, it should be noted that not only does the rubberized case help minimize data loss due to drops and occasionally getting run over by a car, it also offers some protection from the environment. Rated for IP54, the LaCie Rugged RAID protects your data from dust and water. Now, IP54 doesn't mean you can go swimming with it, but it should offer you some peace of mind if rain starts to fall. In order to make sure the drive is protected, you need to ensure that the end cap is in place. The end cap can be used even while the integrated Thunderbolt cable is being used. (This isn't the case for the USB connection.)

When I tested the Rugged RAID, I dropped it a couple of times from about shoulder height (about five

feet). Once, the drive landed on one of its corners; another time, it landed flat on one of its sides. The drive and my data showed no ill effects from this test.

Using the AJA System Test DiskWhackTest with 2 GB (4096x2160) 10-bit RGB, I was getting write speeds of about 241.5 MB/s and read speeds of 238.4 MB/s via Thunderbolt connection to a field-used MacBook Air. (LaCie's spec is 240 MB/s.) This was in the standard RAID 0 configuration and the drive was about 25% full. With the Rugged RAID set for RAID 1, the speed drops by about one half. But, as mentioned, that speed reduction also provides data redundancy.

Rugged, with great speed performance, large capacity, flexibility in connection and the benefit of not having to keep track of a Thunderbolt cable, this unit makes for a great field drive when your data matters.

The LaCie Rugged RAID works on both Mac and Windows, and has an MSRP of $419.99. It comes with a three-year limited warranty. HDVP

Contact: LaCie, www.lacie.com.

ABOVE: The Rugged RAID combines two high-speed drives enclosed in a specially designed rubberized case.

AUDIO ASSIST

(Cont'd from page 26)

ABOVE: The Tascam DR-70D recorder can be mounted directly between a tripod and the camera, resulting in a compact package.

The DR-70D includes overload-resistant, high-quality preamps, with a switchable low-cut filter and limiter, handling of microphone signals in mid/side format, and 24 or 48 volts of phantom power for condenser microphones, as well as many common and not so common functions that facilitate capturing, monitoring and subsequent processing of audio tracks. The four-channel design enables use of two shotgun mics and the stereo mic to record ambience and each speaker individually. Channels 1 and 2 can be set to the stereo input and channels 3 and 4 can be set to the built-in mic, so a large variety of microphone setups are possible.

Tascam focused on making the unit small so it doesn't interfere with camerawork when attached to a camera support system or stabilizer. The unit has tripod screw threads on the bottom side and a removable camera attachment screw on its top. A hot-shoe mount is included so you can attach the recorder in the way most convenient for you by placing it between a tripod and camera or on top of the camera with a hot-shoe. I own the DR-40 and DR-60, the predecessor to the DR-70D, and the sound quality, if you use high-quality mics, is far better than the price the unit sells for. The DR-70D sells for a little over $250 and is available at electronics retailers everywhere. It would be worth your time to take a listen to the DR-70D. HDVP

16 CFR Part 255 Disclosure: Zoom and Tascam didn't compensate me to write this article. No material connection exists between the manufacturers mentioned in the article and myself.

To have audio questions answered, send an email to audioassist@hdvideopro.com.

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True Indie Film

Kodak's Andy Evenski talks Super 8 and film for indies

By The Editors

Courtesy of Kodak

Andy Evenski, Kodak President and General Manager, Entertainment & Commercial Films, with the new Logmar Super 8 camera.

Let's talk about Super 8. What's happening with it?

It's the 50th anniversary, and we're really proud of that. For us, Super 8 is sort of the foothold that brought motion pictures into the home. When you look at the Super 8 format, it started in the home, and a lot of people would shoot baby pictures and family vacations. But, for the majority of families, one person in the family would take over the camera, and from that sprung Steven Spielberg, J.J. Abrams and many others. A lot of people grabbed a camera, and that's how many of our great filmmakers got their start. Also, many Super 8 shooters went on to become well-regarded DPs.

Who's producing Super 8 cameras nowadays?

We still make all of the film, and Pro8mm in Burbank is still producing a lot of the cameras. They can also process your film. One new camera that we'll have here today [at Cine Gear] is the Logmar Super 8 camera, which is a brand-new camera. The Logmar was designed from the ground up, and has a lot of digital features like WiFi and a digital viewfinder. It's just coming to market now.

How are you going to convince indie filmmakers today to shoot Super 8 instead of just using their iPhone with a Super 8 filter app?

It's simple. If you really want to have that film look, you really need to shoot on film. An iPhone, even with specialty filters, just doesn't have that film look. Also, when you shoot on film, you're preserving it. I can go shoot with my iPhone, but I sure hope I have the footage years from now. As you know, as iPhone versions come and go, you lose a lot of data. With film, it's really great for archival, you can retrieve it and go from 2K to 4K, and you have more latitude with film with better color depth. The richness of film—even with a small format like Super 8—is still there.

For indie filmmakers, we launched the Kodak Independent Production Package in the UK, and we already have six shoots going. The way it works is that you come to us and tell us your budget, and we try to make sure you can shoot on film. We'll suggest Super 35, 16, 2-perf or 3-perf, and then we'll provide you with a camera, film, processing, telecine services, and we'll charge you by linear foot. It almost goes back to the George Eastman days—you press the button, we do the rest. We get the whole thing ready to go for you. We're looking to launch it here in the U.S. soon. We're very happy with our new studio contracts and film coalitions, but we really want to get back to the independents so they can shoot film, as well. HDVP

Biopic is an occasional department, where we reach out to leading industry professionals for their views on the craft and business of filmmaking.

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